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WITH

OBSERVATIONS ON ALL THE NEW REMEDIES RECENTLY INTRODUCED INTO PRACTICE,
AND ON THE PREPARATIONS OF THE BRITISH PHARMACOPŒIA.

BY

DR. WILLIAM FRAZER,

LECTURER ON MATERIA MEDICA TO THE CARMICHAEL SCHOOL OF MEDICINE;
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TO

DOMINICK J. CORRIGAN, M.D.,

PRESIDENT OF THE KING AND QUEEN'S COLLEGE OF PHYSICIANS, AND PHYSICIAN
IN ORDINARY TO HER MAJESTY THE QUEEN IN IRELAND, &c. &c.,

AS

A TOKEN OF PROFESSIONAL ESTEEM

FOR HIS NUMEROUS AND VALUABLE CONTRIBUTIONS TO PRACTICAL MEDICINE,

AND

IN ACKNOWLEDGMENT OF MANY FAVOURS CONFERRED ON

HIS FRIEND, AND FORMER PUPIL,

WILLIAM FRAZER.

ELEMENTS

OF

MATERIA MEDICA.

in life will depend on a proper application of the resources of Materia Medica to the treatment of disease; and, after long personal study of this special branch, I may be permitted to offer him a few words of advice: never condescend to employ routine or trivial prescriptions, nor use any remedy without being able to give a satisfactory reason why you have ordered it; above all, never employ any substance without endeavouring to understand its properties fully, and the ordinary effects it may be expected to produce. Therapeutics, regarded in its proper position, is one of the most practical departments of our art; it should never be applied to purposes of quackery, or to dishonest attempts at acquiring a reputation through the ignorance and credulity of our fellow-beings.

124, Stephen's Green.

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ELEMENTS OF MATERIA MEDICA.

◆

PART I.

CHEMICAL MATERIA MEDICA.

CHEMICAL INTRODUCTION.

The ordinary system of arrangement of chemical substances which is adopted in all the modern works on this subject consists in the consideration of the non-metallic bodies in the first place, or the metalloids as they are frequently termed, and of the combinations they mutually form with each other—a plan which has many advantages. This group constitutes the electro-negative element in all binary compounds, and most of its members are insulators of the voltaic current; their higher oxidized salts form powerful acids, and as a general rule they are devoid of lustre. It is difficult to draw any decided line of separation between this important class and the metals proper, as some substances appear to form intermediate links; thus, arsenic is closely allied to phosphorus in its chemical relations, whilst in several other respects it combines in itself the marked characteristics of a perfect metal.

The metals, when considered in an aggregate group, are distinguished by possessing a high degree of lustre and opacity; they are good conductors of electricity and of heat, are usually of greater density than the non-metallic bodies, and often ductile and malleable. They are further characterized by being electro-positive, that is, when set free by the decomposition of their salts in a voltaic arrangement, the metal appears at the platinode, or negative wire of the battery. They display little or no tendency to combine chemically with each other, such unions, when they do occur, being termed alloys, and possessing, with trifling modifications, the mixed physical properties of their components, whilst they freely produce well marked salts when allied to the non-metallic elements, or to mineral and vegetable acids. Though generally ponderous, the density of metallic substances is liable to wide variation: thus, lithium is 0·59; potassium 0·86; and sodium, 0·97—all specifically lighter than water. Most of the better known metals range from sp. gr. 6·0 to 10·0; whilst gold is so dense, that it reaches sp. gr. 19·3, and platinum sp. gr. 21·5, being the heaviest of the simple elements. In malleability, gold, silver, and copper take the foremost position; and iron, gold, and platinum, are distinguished for their ductility, and the ease with which they can be drawn into threads. The majority of the metals are white; lead and zinc possess a bluish tinge, and bismuth has a slight reddish hue; iron and arsenic are greyish; but gold is pure yellow, and copper has a full red colour. When reduced to a state of minute subdivision, all metals appear as black powders. A few of them possess distinct odour,—for instance, iron, copper, and tin,—and arsenic whilst volatilizing evolves a strong smell of garlic.

The consideration of the metallic bodies will be taken up according to the subgroups into which they are generally arranged; of alkaline substances, including in them, for greater convenience, ammonia and its salts, which bear so close a resemblance to the corresponding salts of soda and potash; then the alkaline earths, the earths proper, and the ordinary metals, in successive order. At the commencement of each the special metallic base is briefly described, and the distinctive tests detailed, by means of which it can be recognised, whether in a free state or in combination. After this its leading salts are given, with their officinal mode of preparation, an explanation of the chemical changes concerned in the process, their special uses as remedial agents, and their average dose. Following this part, the principal organic substances that are of pharmaceutic interest are considered; thus, cyanogen and hydrocyanic acid are fully dwelt on; the several alcohols and their derivatives, chloroform, the different ethers, acetic and valerianic acid, creasote, &c. In conclusion, a brief explanation is subjoined of the principles that require to be understood respecting the method of volumetric analysis now introduced into the British Pharmacopœia, and of the special apparatus by which its details are usually carried out in practice.

The subjoined tabular list includes all the elementary bodies that are of peculiar interest to us, from entering into the preparation of our ordinary medical remedies, arranged according to the order of succession in which they will be classified hereafter; it also presents those chemical symbols that are used for convenience in representing the primary substances, and for facilitating the study of their mutual reactions. After this follows their respective equivalent or atomic weights, or combining numbers, calculated according to the scale in which hydrogen is assumed as the standard, and considered equal to unity; their density is then described, which for the gaseous elements, oxygen, hydrogen, nitrogen, and chlorine, is compared with an equal bulk of dry atmospheric air; and for all other substances distilled water is taken at the temperature of 60° of Fahrenheit's thermometer.

It appears hardly necessary to state that, as one result of the recent alteration of weights in the Pharmacopœia, the drachm and scruple do not form integral parts of the present system. Whether they will be discontinued in prescriptions remains to be tried; they possess, at least, the merit of convenience, and are sanctioned by long usage.

The attempted systematizing of our officinal preparations is a change of greater practical value. Thus, tinctures prepared with active substances are so proportioned, with few exceptions, that the average dose ranges from fifteen to twenty-five minims, whilst those of less energy can be given to the extent of fʒj. or fʒij.; the dilute mineral acids also now possess nearly similar saturating power, except dilute phosphoric acid, dilute acetic acid which approximates in strength to vinegar, and hydrocyanic acid that is never used for its purely acid properties. Again, those "liquors" containing a salt or alkaloid in solution are reduced to a common strength of four grains to f℥j.; whilst spirits or essences made from volatile oils have f℥j. of the active constituent, added to rectified spirit, f℥ix. Several other examples might be selected from the class of infusions, the decoctions, &c.; but few fall under the special subdivision of chemical preparations.

LIST OF ELEMENTARY SUBSTANCES EMPLOYED IN MEDICAL PREPARATIONS.

Elementary Substances.		Symbol.	Equivalent Weight.	Density.	Atomic Volume.
Metalloids, . . .	Oxygen, ...	O	8	1·1	1
	Hydrogen, . . .	H	1	·062	2
	Nitrogen, ...	N	14	·97	2
	Chlorine, ...	Cl	35·5	2·47	2
	Sulphur, ...	S	16	2·05	⅓rd at 824°.
	Carbon, ...	C	6	..	2
	Iodine, ...	I	127	4·94	2
	Bromine, ...	Br	80	5·39	2
	Boron, ...	Bo	11	..	1
	Phosphorus, . . .	Ph	31	1·83	..
Forming Alkalies,	Sodium, ...	Na	23	·97	..
	Potassium, . . .	Ka	39	·86	..
	Lithium, ...	Li	7	·59	..
Forming Alkaline Earths, ...	Calcium, ...	Ca	20	1·57	..
	Magnesium, . . .	Mg	12	1·7	..
	Barium, ...	Ba	68·5	..	..
Forming Earths,	Aluminum, . . .	Al	13·75	2·6	..
	Cerium, ...	Ce	..	..	..
Metals, ...	Arsenic, ...	As	75	5·8	1
	Antimony, . . .	Sb	122	6·7	..
	Bismuth, ...	Bi	210	9·7	..
	Cadmium, ...	Cd	56	8·6	..
	Chromium, . . .	Cr	26·25	5·9	..
	Copper, ...	Cu	31·75	8·9	..
	Iron, ...	Fe	28	7·6	..
	Gold, ...	Au	196·5	19·3	..
	Lead, ...	Pb	103·5	11·4	..
	Manganese, . . .	Mn	27·5	8·0	..
	Mercury, ...	Hg	100	13·5	..
	Platinum, ...	Pt	98·5	21·5	..
	Silver, ...	Ag	108	10·5	..
	Tin, ...	Sn	59	7·2	..
	Zinc, ...	Zn	32·5	7·0	..

ELEMENTS OF MATERIA MEDICA.

PART I.

CHEMICAL MATERIA MEDICA.

OXYGEN (O).—An elementary non-metallic gaseous substance, not liquefied by pressure; specific gravity, 1·1; without colour, taste, or odour; incombustible, but a powerful supporter of combustion; combining with all the elements except fluorine, and causing brilliant light when burned with phosphorus, sulphur, and several of the metals; it derives its name from its acidifying properties; it also forms neutral and basic oxides; 100 parts of water dissolve 3·5 of this gas; besides rapid oxidation, attended with light and heat, its gradual absorption is observed during processes of decay, or the tarnishing of metals in the air, and as a result of respiration when it becomes absorbed by the blood, and subsequently is carried to the tissues, where it assists in generating animal heat. If respired undiluted, it proves injurious to life, producing excitement, rapidly terminating in exhaustion and death. Its inhalation was tried with little benefit in cholera, phthisis, and asthma.

Preparation.—1st, Chlorate of potash heated gives off oxygen, and leaves chloride of potassium. This process is facilitated by adding a little binoxide of manganese, $KO, ClO_5 = KCl + 6O$; the gas which escapes may be collected over water.

2nd, Red oxide of mercury heated turns black, and separates into mercury and oxygen, $HgO = Hg + O$.

3rd, Bichromate of potash and sulphuric acid heated together form chrome alum and oxygen. This process is used in preparing valerianic acid. $KO, 2CrO_3 + 4SO_3 = (KO, SO_3 + Cr_2O_3, 3SO_3) + 3O$.

Ozone.—An allotropic state of oxygen, having a peculiar odour resembling phosphorus, obtained by passing a series of electric sparks through dry air, or by exposing phosphorus to the air in a bell-glass suspended over water. Though a minute quantity of ozone is generated, its smell is easily recognised, and it acts as a powerful bleaching and oxidizing agent; it liberates iodine from iodide of potassium, slowly oxidizes moist silver leaf, and converts yellow into red prussiate of potash. A heat not above boiling water destroys it. The specific gravity of ozone is four times that of oxygen.

HYDROGEN (H).—This gas is the lightest known substance; its specific gravity is ·068, or $\frac{1}{16}$th the weight of oxygen. Its chemical relations are those of a volatile metal. It has never been liquefied, is colourless, and, if pure, without odour. It burns in contact with air, causing a yellowish flame; extinguishes a light plunged into it; and forms an explosive mixture with oxygen, which, ignited with proper precautions, produces the intense heat of the oxy-hydrogen blowpipe. If respired, it alters the voice to a shrill tone. This is not always a safe experiment, as the gas is liable to contain arseniuretted hydrogen when prepared carelessly. Hydrogen constitutes an essential element in water; exists abundantly in animal and vegetable substances, and in the hydracids, as hydrochloric and hydrocyanic acid.

Preparation.—Hydrogen is obtained by decomposing water with a galvanic current, or by adding an easily oxidized metal, as iron or zinc, to dilute sulphuric acid. The metal combines with the oxygen of the water, forming a soluble sulphate, and hydrogen escapes.

$$\begin{matrix}\text{Zn}\\ \text{Fe}\end{matrix} + \text{HO}, \text{SO}_3 = \text{H} + \begin{matrix}\text{ZnO}, \text{SO}_3\\ \text{FeO}, \text{SO}_3.\end{matrix}$$

When zinc dissolves in diluted hydrochloric acid, hydrogen is given off, and a chloride of zinc results, $\text{Zn} + \text{HCl} = \text{ZnCl} + \text{H}$.

WATER (HO) is composed of two volumes of hydrogen combined with one of oxygen, or, by weight, of eight of oxygen to one of hydrogen. Pure water at 60° Fahrenheit is taken as the standard for all densities of liquids and solids; it boils at 212° at the level of the sea, and under ordinary atmospheric pressure, and has its point of maximum density at 39°; its freezing point is liable to vary, but it always melts at 32°. Whilst solidifying, it becomes absolutely pure, even gas being expelled. The composition of water is determined analytically by separating its constituents, or synthetically by combining hydrogen and oxygen, burning them together, or reducing heated oxide of copper by a current of pure hydrogen. In pharmacy, water enters into the composition of *hydrates*, as lime or potash, forming definite compounds, not belonging to the class of ordinary salts. Water of Crystallization is necessary for the existence of saline bodies in a crystalline state; thus most sulphates require 7 HO, alum, and phosphate of soda, 24 HO, whilst nitrates contain no aqueous constituent. Basic Water enters as an integral component into salts, the oxide of hydrogen acting like a metallic oxide, as in the bisulphate of potash, $\text{KO}, \text{HO}, 2\,\text{SO}_3$.

DISTILLED WATER is used in all pharmaceutic preparations. If f℥j. is evaporated in a clean glass capsule, it should leave no visible residue. It remains unaffected with sulphuretted hydrogen, oxalate of ammonia, chloride of barium, and lime water, showing respectively the absence of metals, lime salts, sulphates, and carbonic acid. If traces of organic matters are present, nitrate of silver causes a dark or reddish precipitate after some hours' exposure to light. An immediate curdy deposit would denote chlorides.

Preparation.—Take water free from taste and odour, 10 gallons; distil from a copper still, connected with a block tin worm; reject the first half gallon, and preserve the next eight gallons.

RAIN WATER is liable to contain traces of ammonia, nitric acid, and soot, with dissolved gases; SPRING and WELL WATERS generally hold in solution different saline matters, of which sulphate and carbonate of lime are distinctive of hard waters. Animalcules in water denote the presence of decaying organic substances; and nitrates are not uncommon in springs near cemeteries. When springs are impregnated with large quantities of salts, they constitute

MINERAL WATERS, of which the chief varieties are—

ACIDULOUS or CARBONATED—sparkling from carbonic acid, and often containing carbonate of soda—as Carlsbad and Wiesbaden warm, and Selters and Kissingen cold springs.

SULPHUROUS—containing sulphuretted hydrogen, and blackening salts of lead and silver. Bareges, in the Pyrenees, is warm; and Harrowgate and Lucan, cold sulphur springs.

CHALYBEATE—of styptic inky taste, with carbonate of iron, dissolved by carbonic acid; if boiled, or exposed to air, depositing brown sesquioxide of iron, as Spa or Tunbridge; more rarely having sulphate of iron, and not altered by boiling, as the Moffat spring.

SALINE WATERS—divided into—

Purgative, with sulphate of magnesia, as Epsom or Seidlitz springs; or sulphate of soda, as Cheltenham.

Brine, containing chloride of sodium, as Nantwich.

Calcareous, with sulphate or carbonate of lime, as Bath.

Alkaline, yielding soda, as Malvern, Ems, and Vichy.

NITROGEN, OR AZOTE (N).—A colourless gas, free from taste or smell: specific gravity, ·97; not combustible; nearly insoluble in water, and rather lighter than air; it is respirable, but incapable of supporting life, and constitutes four-fifths of the atmosphere, which consists of 77 nitrogen to 23 oxygen by weight, or 79 nitrogen to 21 oxygen by volume, with small quantities of carbonic acid and watery vapour. Nitrogen has not been liquefied; it is an essential constitution of the alkaloids, of fibrine, albumen, and gelatine.

Preparation.—1. Burning phosphorus in a jar of air over water removes the oxygen as phosphoric acid, which dissolves in the water, leaving nearly pure nitrogen.

2. Chlorine passed into an excess of ammonia forms chloride of ammonium and nitrogen, $4NH_3 + 3Cl = 3NH_4Cl + N$.

COMPOUNDS OF NITROGEN AND OXYGEN.

Protoxide of Nitrogen (NO).—A colourless gas, of sweet taste; sp. gr. 1·52; causing excitement when respired, and hence termed laughing gas; it liquefies under a pressure of 50 atmospheres. *Preparation.*—By heating nitrate of ammonia, protoxide of nitrogen and water result, $NH_4O, NO_5 = 2NO + 4HO$.

Binoxide of Nitrogen (NO_2).—A colourless gas when collected over water, but irrespirable, as with air it rapidly forms nitrous acid, yielding orange fumes. This gas constantly escapes in preparing metallic nitrates. Thus silver, heated with nitric acid, forms nitrate of silver and binoxide of nitrogen, $3Ag + 4NO_5 = 3AgO, NO_5 + NO_2$.

Nitrous Acid (NO_3).—Obtained by mixing NO_2 with one-fourth of dry oxygen. It forms deep red fumes, condensed at a cold of 0° into a blue liquid.

Hyponitric Acid (NO_4).—Formed by mixing NO_2 with half its bulk of oxygen. It can be got in colourless crystals, which melt into an orange liquid and into a deep red vapour. Both the latter compounds of nitrogen and oxygen are often present in commercial nitric acid.

Nitric Acid (NO_5)—Is got in anhydrous crystals by passing chlorine over fused nitrate of silver. They have no acid reaction until dissolved.

ACIDUM NITRICUM.—**Nitric Acid** ($2NO_5, 3HO$.)—The liquid acid is colourless, or faint yellow, fuming in the air, of suffocating odour, intensely corrosive and acid. When strongest it is represented by NO_5, HO; of sp. gr. 1·52, having 86 per cent. of real acid; this is difficult to obtain, and for all practical purposes a weaker acid is preferred. If containing 80 per cent. of real acid, its sp. gr. is 1·50; it consists of $2NO_5, 3HO$, and is of full pharmacopœial strength. Still further diluted until it consists of 60 per cent. of acid, sp. gr. 1·42, a stable hydrate, $NO_5, 4HO$, is got, which distils unchanged at 250°, and has no action on tin or iron, though a weaker or stronger acid freely dissolves them. When nitric acid acts on metals, binoxide of nitrogen is usually evolved. In some instances, if the acid is much diluted, protoxide of nitrogen forms, as with zinc or iron, and occasionally water and the acid both decompose, producing ammonia.

$$3Ag + 4NO_5 = NO_2 + 3AgO, NO_5.$$
$$4Zn + 5NO_5 = NO + 4ZnO, NO_5.$$
$$8Sn + 9NO_5 + 8HO = 8SnO, NO_5 + NH_4O + 4HO.$$

The violence with which nitric acid, sp. gr. 1·5, acts upon straw, sawdust, &c., is such, that its conveyance is dangerous, and many prefer keeping the weaker acid, sp. gr. 1·42. If this is employed for preparations, the following rule must be observed:—"Three measures of the stronger are equivalent to four of the weaker acid."

Preparation.—Place nitrate of potash, lb.ij., in a plain retort; add sulphuric acid f℥xvij.; pass the neck of the retort at least five inches into the glass tube of a Liebig's condenser, and distil over the acid with a heat which, towards the end of the process, must be raised to liquefy the contents of the retort.

The reaction consists in the formation of nitric acid and bisulphate of potash, which enables the acid to escape at a lower temperature, and is easier removed from the retort subsequently than sulphate of potash would be, $KO, NO_5 + 2HO, SO_3 = KO, HO, 2SO_3$, and NO_5HO. Some nitric fumes are lost in the commencement and end of the process; and, the sulphuric acid containing an excess of water, the resulting product is less strong than theory indicates.

Purity.—If evaporated, it should leave no residue; diluted with six volumes of water, its freedom from sulphuric acid and chlorides is shown by giving no precipitates with chloride of barium, or nitrate of silver. Its strength is determined by f℥j.; requiring for neutralizing 121·5 measures of the volumetric solution of soda. Nitrous fumes impart a yellow, red, or green colour; they are removed by diluting and re-distilling with a little bichromate of potash. Any excess of water will lower the density and saturating power of the acid.

Tests.—The most delicate is solution of sulphate of iron, which yields an olive colour with nitric acid; it also reddens morphia, destroys the colour of indigo, and gives off orange fumes with copper.

Effects.—Strong nitric acid is an energetic caustic, used for phagedenic sores and hospital gangrene, and strongly recommended by Erichsen to destroy the poison of primary syphilitic ulcers; it should be applied to the living tissues with lint on a rod of wood or glass, and afterwards a weak alkaline solution washed over the surface, to prevent excessive corrosion; it is also employed to vascular hæmorrhoids and prolapsus ani, in which it serves to contract the part, and promote adhesion with the deeper structures. Poisoning with this acid is rare; it causes immediate pain and erosion wherever it touches; the tongue and mouth become swollen and stained of yellow colour; the vomited matters are acid, mixed with altered blood and shreds of coagulated mucus; orange eructations are described as rising from the stomach; there are symptoms of profound collapse, and death generally ensues within twenty-four hours. The stomach and œsophagus are found softened by it, and altered to deep yellow or brown, in patches, with blackened blood in the vessels, and intense vascularity; but perforation is rare; death has also resulted from injury to the throat or larynx; and, should the first effects of the poison subside, a chronic state of gastric disease may ensue.

Antidotes.—All mineral acids require weak alkaline solutions to neutralize them, or chalk or magnesia suspended in water, and diluents; the stomach pump should never be employed.

ACIDUM NITRICUM DILUTUM.—Dilute Nitric Acid.—Is a colourless solution, similar in its reaction to nitric acid, sp. gr. 1·101, fʒvj. should neutralize 100 parts of the volumetric soda solution.

Preparation.—Nitric acid, f℥ij.; distilled water, f℥xiij. Mix.

Effects.—A useful tonic in dyspeptic affections, the gastric derangements of children, and for urinary deposits of phosphates or oxalate of lime; it was formerly supposed to possess direct antisyphilitic powers, and is still much used after repeated mercurial courses and in broken-down states of the constitution, though solely as a tonic; it has lately been recommended for chronic enlargements of the liver in scrofulous patients. The dose ranges from ten to thirty drops properly diluted; about fʒij. may be added to an eight-ounce mixture. Brodie employed it in the proportion of one or two drops of the strong acid to f℥ij. of water, to dissolve phosphatic calculi in the bladder, and to relieve chronic mucous inflammation of that viscus, injected through a double catheter; it is sometimes applied in lotions to unhealthy and chronic ulcers.

CHLORINE (Cl).—A greenish-yellow gaseous element, of strong disagreeable odour, causing, when respired, irritation and coughing; heavier than air; sp. gr. 2·4; readily soluble in cold water or mercury, and best collected over warm water, or by displacement; it liquefies with a pressure of four atmospheres into a yellow fluid; is not combustible, but, from its strong affinity for hydrogen, abstracts it from turpentine and other substances, inflaming them, and depositing carbonaceous matter; it also unites with some of the metals, as antimony and arsenic, which take fire in it spontaneously. Chlorine is used for deodorizing, and to make chlorine water; it is got by heating salt, sulphuric acid, and binoxide of manganese, which form sulphate of soda, sulphate of manganese, and chlorine, $NaCl + MnO_2 + 2SO_3 = NaO, SO_3 + MnO, SO_3 + Cl$; it bleaches powerfully, abstracting hydrogen from the colouring matter, and sometimes replacing it in the compound, or acts indirectly as an oxidizing agent.

Test.—Chlorine and all chlorides give a curdy precipitate with nitrate of silver, insoluble in dilute nitric acid, and soluble in ammonia.

LIQUOR CHLORI.—Chlorine Water.—Water at ordinary temperatures dissolves about two volumes of chlorine, forming a pale yellow solution, with a strong smell of the gas, and acrid styptic taste; it requires to be kept cool, as it will decompose into hypochlorous and hydrochloric acids, $HO, 2Cl = HCl + ClO$.

Preparation.—An ounce of binoxide of manganese is gently heated with hydrochloric acid, f℥vj., diluted with distilled water, f℥ij. The gas that escapes is passed through a small phial containing f℥ij. more water to wash it, and then into a Oiij. bottle holding ℥xxx. of distilled water, loosely plugged with tow. After the gas ceases to come off, this bottle is corked and well shaken, to aid the solution of the gas, and the fluid preserved in a green glass bottle to exclude the light.

The reaction is the formation of chloride of manganese, water, and chlorine, $MnO_2 + 2HCl = MnCl + 2HO + Cl$. Any traces of hydrochloric acid that pass over are intercepted by the washing bottle.

Effects.—Though chlorine destroys odours, its powers of disinfecting are doubtful; if used for this purpose, it is set free from chloride of lime with an acid, and when employed in inhabited rooms, must be largely diluted by air; it proves of service in poisoning with sulphuretted hydrogen, which it decomposes, and may be inhaled diffused through the atmosphere, using artificial respiration when the patient is insensible. The solution is added to gargles for putrid sore throat, and the ulcerations of scarlatina and syphilis, and sometimes prescribed internally for gangrenous affections and dysentery, and also applied in lotions to fœtid and cancerous sores; in a concentrated state it acts as a caustic.

Dose.—fʒss. to fʒij. added to 8 ounces of fluid.

ACIDUM HYDROCHLORICUM.—Hydrochloric Acid (HCl).—The liquid acid formerly termed spirit of salt, if pure, should be colourless, or very pale yellowish-green in quantity. It is a solution of hydrochloric gas in water, represented by the symbols $HCl, 7HO$; sp. gr. 1·17; containing about 35 per cent. of real acid; it fumes in the air, and parts freely with the gas when heated; does not bleach vegetable colours, or discolour gold leaf. The gas is colourless, irrespirable, and slightly irritating, forming dense fumes in moist air, instantly absorbed by water, which can take up 450 volumes of it, the temperature and bulk of the liquid increasing considerably; under a pressure of 40 atmospheres it becomes liquefied.

Preparation.—Sulphuric acid, f℥xliv., is mixed with water, f℥xxxvj., allowed to cool, and added to dried common salt, lb.iij. in a flask of one gallon capacity. The gas which escapes is passed through water, ℥iv., in a washing bottle, and then into distilled water, f℥l., into which the tube dips for a short distance, and the process continued until f℥lxviij. are obtained, keeping the temperature down to favour its absorption. (In this process heat is requisite to develope the gas.) When salt is heated with sulphuric acid, bisulphate of soda is left, and hydrochloric gas evolved, the solution of which in water forms the liquid acid, $NaCl + 2HO, SO_3 = NaO, HO, 2SO_3 + HCl$.

Tests.—It gives a curdy white precipitate with nitrate of silver, like chlorine, but is distinguished by not tarnishing copper foil, if free from that gas. When of proper strength, fʒj. neutralizes 60·25 measures of the volumetric soda solution.

Impurities.—Free chlorine causes a slight yellow colour; the deep yellow of the commercial acid results from the presence of iron, being made in iron vessels; this is tested by giving a blue with ferrocyanide of potassium; sometimes sulphuric acid is carried over; or, more important, arsenic may be derived from the use of impure oil of vitriol; it is detected by Marsh's test.

Effects.—It is applied as a caustic to gangrenous and phagedenic sores, and to sloughing ulcers of the mouth, and, when diluted, to destroy diphtheritic exudations; its action is less powerful than the other mineral acids. If taken internally, it produces all the symptoms of a corrosive poison, eroding the stomach and œsophagus.

Antidotes.—Soda, chalk, magnesia, and the free use of diluents.

ACIDUM HYDROCHLORICUM DILUTUM.—**Dilute Muriatic Acid.**—A colourless acid fluid, of density, 1·05, resembling the stronger acid in chemical properties; fʒvj. will saturate 99 measures of the volumetric soda solution.

Preparation.—Muriatic acid, f℥iij.; distilled water, f℥viij. Mix.

Effects.—A tonic given in urinary deposits of the phosphates and of oxalate of lime; also for dyspeptic affections, usually combined with bitters. This acid is frequently added to gargles. **Dose**, ten to thirty drops; about fʒij. can be prescribed in an eight-ounce mixture.

ACIDUM NITRO-HYDROCHLORICUM DILUTUM.—**Dilute Nitro-hydrochloric Acid.**—A yellow-coloured acid, from containing free chlorine, and also nitrous fumes; in its concentrated form known as aqua regia. Its sp. gr. is 1·074; fʒvj. saturate 93.8 measures of the volumetric soda solution, all the dilute acids being closely of the same strength.

Preparation.—Distilled water, f℥xxvj.; add nitric acid, f℥ij., and then muriatic acid, f℥iv.

The reaction may be assumed to consist in the escape of chlorine, $3\,HCl + NO_5 = NO_2 + 3\,HO + Cl$; and, as the gas is slowly evolved, the acid is a powerful solvent for gold. The ruddy fumes, however, which are formed consist of chlorosonitrous acid, NO_2Cl, or chlorosonitric acid, NO_2Cl_2.

Effects.—A useful combination, much employed in the same cases as dilute nitric and muriatic acids, and in similar doses.

SULPHUR SUBLIMATUM.—Sulphur (S).—For medical use should always be obtained from Sicilian sulphur, where it is found in a pure state in beds of a blue clay, as if sublimed from metallic ores it is likely to contain a notable quantity of arsenic. Sulphur varies from deep to pale yellow, is brittle, opaque, and a bad conductor of heat or electricity; it has a faint odour, and when burned forms sulphurous acid; it melts at 239°, becomes viscid at 350°, again fuses at 500°, and volatilizes at a higher temperature; it is soluble in bisulphide of carbon, and can be got in two crystalline states,—one from solution, the other by subliming,—which vary in their fusing points and density. Sublimed sulphur is formed by distilling its vapour into large rooms, where it falls in minute particles; and brimstone, by remelting the sublimed sulphur in wooden moulds.

Impurity.—The sulphide of arsenic is of chief importance; it will dissolve in water of ammonia, and precipitate on evaporating or adding an acid.

Effects.—Sulphur is usually prescribed in electuary, or with magnesia; it acts as a mild aperient, and appears to stimulate the liver and intestinal glands, increasing their secretions; if long used, it certainly is absorbed, and, exhaling through the body, will blacken silver articles in the pockets of those taking it. It is of service in hæmorrhoidal affections, and for chronic rheumatism occasionally, though of little benefit in cutaneous diseases, unless as a local application. Sulphur ointment has a high reputation for removing scabies, which some consider to depend on an acarus, the sarcoptes hominis. I cannot think there is much necessary connexion between the insect and the disease; at all events, itch is easily cured by a single application of a solution of sulphide of calcium, prepared by boiling sulphur and lime in water until they unite; the eruption is to be rubbed with this fluid after a hot bath; it deposits a sulphurous layer, and a second bath leaves the patient well. In chronic eczema sulphur is occasionally added to starch as a dusting powder, to relieve irritation of the part; but in any eruption, so long as the pain is felt like that of scalding water, sulphur and its preparations are found to increase the distressing sensations.

Dose.—30 to 60 grs. in electuary, or suspended with milk.

UNGUENTUM SULPHURIS.—Sulphur Ointment.—Used for scabies; to increase its efficacy, some veratrum is frequently added, or aromatic oils, which render its use less unpleasant.

Preparation.—Sulphur, one part; lard, four parts. Mix.

CONFECTIO SULPHURIS.—Sulphur Electuary.—Prescribed in doses of a teaspoonful once or twice in the day.

Preparation.—Sublimed sulphur, ℥iv.; acid tartrate of potash, ℥j.; syrup of orange peel, f℥iv. Mix.

SULPHUR PRECIPITATUM—Precipitated Sulphur.—Is a soft yellowish-white powder, similar in its effects to ordinary sulphur. It is liable to be adulterated with sulphate of lime, from using sulphuric acid in its preparation. This is recognised by the microscope, which will show crystals of sulphate of lime mixed with the amorphous granules of sulphur, or by heat, the impurity being left after the sulphur sublimes.

Preparation.—Sublimed sulphur, ℥v.; slaked lime, ℥iij.; distilled water, Oj.; boil for fifteen minutes, stirring with wood, and filter; boil the residue again with distilled water, Oss., and filter; to the mixed fluids, cooled, and diluted with distilled water, Oij., add successive quantities of acid (muriatic acid, f℥viij., mixed with distilled water, Oj.), letting the fumes escape by a chimney until effervescence ceases, and the fluid is acid; let the precipitate subside, wash it repeatedly with distilled water until the fluid ceases to precipitate with oxalate of ammonia. Collect the precipitated sulphur on a calico filter, wash it once with distilled water, and dry at a temperature not exceeding 120°.

Sulphur boiled with lime forms pentasulphide of calcium, and hyposulphite of lime, $3\ CaO, HO + 12\ S = 2\ CaS_5 + CaO, S_2O_2$; on adding hydrochloric acid, almost all the sulphur is precipitated, some sulphuretted hydrogen escaping.

ACIDUM SULPHUROSUM—Sulphurous Acid (SO_2).—A colourless aqueous solution of the gas, of which thirty to forty volumes dissolve in cold water; it has the pungent, suffocating odour of burning sulphur, and considerable bleaching powers; by keeping oxygen is absorbed, and some sulphuric acid formed, the presence of which is shown by its giving a precipitate with chloride of barium; it also precipitates copiously if solution of chlorine be added previous to testing, $Cl + HO + SO_2 = SO_3 + HCl$.

Preparation.—Sulphuric acid, f℥iv.; coarse powdered wood charcoal, recently burned and dried, ℥j.; heat in a glass flask by a spirit lamp; wash the evolved gas by passing it through water, f℥ij., in a bottle, and conduct it to the bottom of a Oj. bottle filled with distilled water, and kept cool, to favour its absorption, until the gas escapes as freely from it as it enters the washing bottle. It requires to be kept in a stoppered vessel, and cool; sp. gr. 1·04.

Carbon and sulphuric acid, heated, evolve carbonic and sulphurous acids; the former passes off, the latter dissolves in water, $C + 2\ SO_3 = CO_2 + 2\ SO_2$.

Effects.—Chiefly employed for parasitic cutaneous affections, rubbed to the part until it excites heat and irritation, or applied in lotions on lint, usually diluted with two to four parts of water, and covered with oil silk; it is supposed to destroy the vitality of those low vegetative organizations on which the diseases depend.

ACIDUM SULPHURICUM—Sulphuric Acid (HO, SO_3).—The commercial oil of vitriol is a dense oily-looking, colourless fluid, without odour, highly acid, and corrosive; sp. gr. 1·84 to 1·85; charring organic matters from its affinity for water, and absorbing moisture if exposed to the air; mixed with an equal quantity of water, it evolves considerable heat, and undergoes some condensation in bulk; it is often of brown colour, from charred vegetable substances accidentally added to it, as straws; and, being largely prepared by roasting iron pyrites, may contain appreciable quantities of arsenious acid, which unfits it for medical purposes.

PREPARATION.—Sulphurous acid, derived from burning sulphur or iron pyrites, is conveyed into a large leaden chamber, containing a thin layer of water, steam and nitric acid fumes are also passed in; the acids react, and the sulphuric acid that results dissolves in the water, $NO_5 + SO_2 = SO_3 + NO_4$; the latter gradually re-forms nitric acid, which continues the process, and binoxide of nitrogen, which attracts oxygen from the air in the chamber, and becomes hyponitric acid, $3\,NO_4 = 2\,NO_5 + NO_2$, which $+ 2\,O = NO_4$.

When the vitriol in the chamber reaches sp. gr. 1·6, it is placed in glass vessels, and the excess of water distilled off until of sp. gr. 1·84, represented by HO, SO_3.

TESTS.—The strong acid is recognised by its weight, oily appearance, property of charring wood, and evolving heat when mixed with water; chloride of barium forms with sulphuric acid and all sulphates a white deposit of BaO, SO_3 insoluble in dilute acids.

IMPURITIES.—Arsenious acid is detected by diluting with six volumes of water, adding some pure zinc, and igniting the hydrogen as it escapes through a capillary tube; if a dark stain is deposited on porcelain held in the flame, it is to be rejected; when diluted with water, some sulphate of lead usually precipitates, being soluble only in strong vitriol; any traces of nitrous acid are recognised by pouring solution of sulphate of iron over the surface of the acid cautiously, and observing if a red tint appears at the line of contact; both the latter are removed in "pure sulphuric acid."

THE SULPHURIC ACID of medicine is of sp. gr. 1·846, each f℥j. requiring 206 measures of the volumetric soda solution for neutralization; it should be an absolutely pure monohydrated acid, HO, SO_3.

PREPARATION.—Add sulphate of ammonia, ℥½, to sulphuric acid of commerce, f℥xij., in a retort; place in it a few platinum slips, and cover the upper part of the retort with a sheet iron hood; distil; reject the first tenth, and collect the rest in a fresh flask, until f℥j. only is left in the retort.

In this process of Wittsteins, water, nitrogen, and sulphuric acid result from the destruction of any nitrous acid present, $NH_4O, SO_3 + NO_3 = 4\,HO + 2\,N + SO_3$; the sulphate of lead is left in the retort; the first portion that distils is rejected for deficiency in strength, and occasionally some sulphurous acid comes over.

Effects.—Sulphuric acid is the best caustic for the bites of rabid animals; it is occasionally applied in entropeon with a thin slip of wood, to evert the lid, by causing a cicatrix. Vitriol can be taken as the type of a corrosive poison; it unites with the albumen of the parts which it touches, producing grey eschars, or intense black sloughs; it causes instant and severe pain in the mouth, throat, and stomach; acid fluids are vomited, often mixed with dark blood; and there may be difficulty of breathing and deglutition from injury to the larynx and œsophagus. The usual signs of extreme exhaustion ensue rapidly; the skin is cold and clammy, the pulse feeble and quick, but the intellect is usually undisturbed, and, in most cases, death occurs suddenly in eighteen to twenty-four hours after the poison is taken; the matters which are vomited are highly acid, and will effervesce with carbonates, and stain cloth of a moist brown colour, the vitriol in these stains remaining unchanged for years, and capable of being tested. In fatal cases, besides the corrosion of the mouth and throat, the stomach is filled with dark tarry contents, charred extensively, and often perforated by a ragged aperture, through which the acid, escaping into the peritoneum, may have acted on the intestines or aorta; and, if life was prolonged for a sufficient time, there are evidences of intense inflammation discovered. Should the patient survive, he runs the risk of chronic gastric disease, and of stricture of the œsophagus; the quantity of food in the stomach has much to do with a favourable result; a teaspoonful will perforate an empty stomach, and much more be recovered from if it chances to be full.

Antidotes.—Carbonate of soda, chalk, or magnesia, with abundance of diluents—a little is injurious, from the heat of its combination with the acid. The stomach pump is liable to injure the stomach and œsophagus in poisoning by any mineral acid, and should not be used.

ACIDUM SULPHURICUM DILUTUM.—Dilute Sulphuric Acid.—Sp. gr. 1·087; fʒvj. will neutralize 100 measures of the volumetric soda solution, all the dilute mineral acids having similar saturating properties.

Preparation.—Sulphuric acid, f℥iij.; distilled water, ℥xxxv. Mix.

Effects.—This acid, properly diluted, is prescribed to check excessive perspiration in phthisis and other diseases; as an astringent in colliquative diarrhœa, for bilious choleraic attacks, and to relieve the painless purging so common in cholera epidemics which often precedes the more dangerous seizure; for the latter purpose it must be given at short intervals of twenty minutes or less, in fʒss. doses; it is also much valued in passive hæmorrhages from the lungs, bowels, or uterus; in such cases, I frequently combine it with gallic acid in solution. In pharmacy this acid is used to increase the solubility of quinine; to extract the colouring from roses, for preparing gargles and mixtures; and to disguise the taste of epsom salts. A sulphuric lemonade is employed in lead factories, as an ordinary drink, by the workmen, and considered useful in preventing attacks of colic, by rendering any of the metal accidentally swallowed comparatively inert.

Dose.—Five to thirty drops diluted; fʒij. are sufficient for f℥viij. of fluid.

ACIDUM SULPHURICUM AROMATICUM.—**Aromatic Sulphuric Acid.**—A simplification of the old *Mynsichts elixir*, of reddish-brown colour, aromatic odour, and grateful acid taste when diluted; its sp. gr. is ·935; every ʒvj. should neutralize 84·75 measures of the volumetric solution of soda; it contains some sulphovinic acid, but most of its sulphuric acid exists in a free state.

Preparation.—Sulphuric acid, f℥iij.; rectified spirit, ℥xxxv.; mix gradually, and add cinnamon, ℥ij.; ginger, ℥i.½; each in coarse powder; digest for seven days, agitating frequently; filter, and add rectified spirit to obtain Oij.

Effects.—Similar to the dilute acid; it is somewhat weaker, and given in larger doses.

SULPHURETTED HYDROGEN (HS).—A fœtid colourless gas, smelling strongly of rotten eggs; when respired in a concentrated state, it causes narcotic symptoms; and, even diluted, will excite nausea, vertigo, and convulsive symptoms; it burns with a blue flame, liquefies by pressure, and is rather heavier than air. This gas is the distinctive constituent of sulphurous waters, and often generated in sewers; it is best destroyed by chlorine, which abstracts its hydrogen.

Preparation.—Sulphide of iron, ℥ss., water, f℥iv., are placed in a bottle closed by a cork, through which passes a funnel, dipping below the surface of the water, and also a tube for the escape of the gas. Through the funnel from time to time sulphuric acid is added, as the sulphuretted hydrogen is required.

Sulphide of iron, sulphuric acid, and water, form sulphuretted hydrogen, and sulphate of iron in solution, $FeS + HO, SO_3 = FeO, SO_3 + HS$.

Tests.—Its offensive odour, and property of blackening salts of lead and silver, forming sulphides.

Uses.—This gas is much employed to test metals, thus it forms with lead, silver, mercury, copper, and bismuth, precipitates in acid solutions, insoluble in hydrosulphide of ammonium; whilst the sulphides of tin, antimony, and arsenic, redissolve; and zinc, manganese, and protoxide of iron, only deposit from neutral or alkaline solutions with hydrosulphide of ammonium, not sulphuretted hydrogen.

Antidotes.—Chlorine diffused in the air, and artificial respiration; cold affusion may be required, and stimulants externally.

CARBON (C).—The interesting modifications of this element, diamond and graphite, are useless in medicine. Wood and animal charcoal are employed.

CARBO LIGNI.—Wood Charcoal.—Is got by burning billets of soft wood in iron cylinders, excluding the air, and afterwards slowly cooling; as it rapidly condenses gases and odours, it ought to be recently made or reheated, and allowed to cool under a layer of sand before being applied to medical purposes; thus a cubic inch of charcoal will absorb ninety volumes of ammonia, fifty-five of sulphide of hydrogen, and thirty-five of carbonic acid; from its property of removing smells, it has been proposed as a disinfectant; but Dr. Stenhouse has demonstrated this to depend on rapid oxidation of the products of decay, and the substitution of odourless for odorous compounds, rather than any power of arresting putrefaction. When of good quality, the ash left after its combustion should not exceed two per cent.

Effects.—Trays of charcoal powder are used to absorb odours in hospitals and sick rooms, and it is frequently employed to purify water for drinking, and in filtering apparatus. Internally it is given in doses of thirty to sixty grains for pyrosis, gastralgia, and fœtid discharges from the bowels, and to relieve hysterical flatulence; it also forms

CATAPLASMA CARBONIS.—Charcoal Poultice.—Is applied to gangrenous and offensive ulcers, and cancerous sores, to relieve the fœtor and improve the part.

Preparation.—Macerate bread, ℥ij. in boiling water, f℥x. for a short time, near the fire; add linseed meal, ℥iss.; mix; and then stir in ¼ ounce pulverized charcoal; after thoroughly incorporating, sprinkle as much more charcoal over the surface of the poultice.

CARBO ANIMALIS PURIFICATUS.—Purified Animal Charcoal.—Animal charcoal is got by burning ox and sheep bones in closed vessels; it consists of phosphate of lime, with some carbonate, traces of nitrogen, and seldom above 18 per cent. of carbon, and requires to be purified for use. From its minute state of division, it is more energetic as a decolorizing and deodorizing agent than wood charcoal.

Preparation.—Hydrochloric acid, f℥x.; distilled water, Oi.; mix; add bone black, ℥xvj.; digest for two days, stirring frequently; collect the carbon on a calico filter, and wash with distilled water so long as the washings precipitate with nitrate of silver; lastly, dry and heat the carbon to redness in a covered crucible.

The acid converts phosphate of lime into soluble superphosphate, and chloride of calcium, and dissolves any traces of carbonate of lime, $PO_5, 3CaO + 2HCl = PO_5, CaO, 2HO + 2CaCl$; these are subsequently washed out with water so long as nitrate of silver shows the presence of phosphates or chlorides.

Purity.—If perfectly dry, tincture of litmus diluted with twenty times its bulk of water, and agitated with it (in sufficient quantity), and thrown on a filter, passes through colourless. Burned with access of air, it leaves scarcely any residue.

CARBONIC ACID (CO_2).—A colourless gas, heavier than air, of faint acidulous taste and smell; not inflammable or capable of supporting combustion; liquefied by a pressure of 38 atmospheres into a colourless liquid, a portion of which freezes as the pressure is removed, developing extreme cold. It abounds in caves, old wells, &c.; freely escapes in fermentation, and in mines is known as choke damp. The pure gas is irrespirable, and rapidly fatal; diluted, it acts as a narcotic poison, and the atmosphere is unsafe when a lighted candle will not burn with a brilliant light; even one per cent. of this gas in air is injurious. Water will dissolve two-thirds its bulk of carbonic acid, and much more under pressure, which is made use of in preparing artificial mineral waters, as soda water; and it constitutes the solvent for carbonate of iron, or lime in springs. All effervescent mixtures owe their agreeable taste to this gas escaping from some carbonate, as soda or potash, on the addition of an acid. The following table of saturations is of practical use; every 18 grains of citric or tartaric acid is equivalent to fʒss. lemon juice, and requires $\frac{1}{4}$th the atom in grains of carbonated salts of potash or soda, or $\frac{1}{8}$th of carbonate of ammonia, for neutralization:—

$NaO, CO_2, 10HO$	= 148	atomic weight;	$\frac{1}{4}$	of this being	36	grains.
$NaO, 2CO_2, HO$	= 84	,,	$\frac{1}{4}$	,,	21	,,
$KaO, 2CO_2, HO$	= 100	,,	$\frac{1}{4}$	,,	25	,,
$2NH_4O, 3CO_2$	= 118	,,	$\frac{1}{8}$	,,	15	,,

Preparation.—Carbonic acid is expelled from any carbonate on adding another acid (except hydrocyanic, which does not decompose carbonates).

Tests.—This gas renders lime water turbid; if added in excess, the solution again clears.

Effects.—Undiluted, the gas is irrespirable, and causes rapid asphyxia; in a dilute state it enters the lungs, inducing insensibility, convulsions, and venous engorgement of the lungs, brain, and right side of heart, interfering with the aëration of the blood,—effects similar to those observed in fatal cases of drowning or hanging, in which death is due to the carbonic acid generated within the system, and prevented from escaping through its ordinary channel.

Medically, a stream of carbonic acid is employed in some instances, injected into the rectum or vagina for painful affections, and stated to be most successful in relieving cancerous disease of the uterus.

In effervescing draughts the gas can be taken in large quantities; it acts as a local tonic, relieves febrile thirst, and allays irritability of stomach and vomiting. When there is much nausea, a few drops of laudanum are a useful addition to such draughts. The effervescing infusion of bark is a well-known mode of employing an agreeable and serviceable bitter.

Antidotes.—Artificial respiration with pure air must be relied on in treating accidents from carbonic acid; warmth applied externally; and, after recovering from the primary effects of the poison, any symptoms of congestion in the lungs or brain relieved by local depletion.

IODUM.—**Iodine** (I.)—This metalloid forms soft scales, resembling plumbago, crystallizing in rhombic octahedrons; it is slightly volatile at ordinary temperatures, giving off a faint chlorine odour, and evaporates more abundantly when moist; it melts at 225°, and boils at 347°, yielding an intense purple vapour. Though sparingly soluble in water, it dissolves freely in alcohol, ether, glycerine, or solutions of the iodides. Its chief source is sea water, whence it is extracted by marine plants during growth; their incinerated ash, termed kelp, contains it, probably as iodide of sodium. Of late attempts are being made to extract it without combustion, by allowing the sea weed to decay and liquefy.

Preparation.—Kelp is dissolved in water, and the solution yields on evaporating carbonate, sulphate, and chloride of sodium, and as it cools deposits chloride of potassium; the residue, termed "mother liquid," is acidulated with sulphuric acid, which evolves carbonic, sulphurous, and sulphuretted hydrogen gases; it is then placed in stills with leaden covers, binoxide of manganese added, and heated, and the iodine vapours condensed as they escape in glass vessels.

Considering the iodine to exist as iodide of sodium, the acid and binoxide of manganese yield sulphate of soda, sulphate of manganese, and iodine, $NaI + MnO_2 + 2\,SO_3 = NaO, SO_3 + MnO, SO_3 + I$.

Impurities.—Water is the most common, which is detected by damping bibulous paper; fixed impurities are rare, coal dust and micaceous iron ore are sometimes present; they are left on subliming the iodine; the most important substance is a trace of the poisonous iodide of cyanogen, separated in preparing pure iodine.

Tests.—Starch strikes a blue colour with free iodine, which disappears on gently heating the solution. The soluble iodides give a dark precipitate with dilute nitrate of palladium; this, which is termed "Lassaigne's test," is extremely delicate; with chloride of mercury they form a scarlet iodide, soluble in excess of iodide of potassium.

PURIFIED IODINE—Is obtained in brilliant scales, or laminar crystals, sometimes of large size, which should be entirely soluble in ether. The white crystals separated in purifying it are intensely poisonous, consisting of iodide of cyanogen.

PREPARATION.—Place commercial iodine in a porcelain capsule, the mouth of which is covered by a flask filled with cold water; the capsule is heated to the temperature of boiling water for twenty minutes, and any white pungent crystals that sublime on the flask carefully removed; a clean flask being substituted, also containing cold water, the vessel with the iodine is then exposed to the heat of a gas flame, when pure iodine sublimes on the bottom of the flask, which is to be collected and preserved in a closed bottle.

PURITY.—12·7 grains dissolved in water, f℥j., with iodide of potassium, gr. xv., require for complete decoloration 100 measures of the volumetric solution of hyposulphite of soda. This salt, in contact with iodine and iodide of potassium, is converted into two colourless compounds, iodide of sodium and tetrathionate of soda, $2\,NaO, S_2O_2 + I = NaI + NaO, S_4O_5$. Hence, 12·7 grains of iodine, being $\frac{1}{10}$th of an atom, should decolorize the $\frac{1}{10}$th of two atoms of hyposulphite contained in the volumetric solution.

EFFECTS.—Pure iodine should be employed in all officinal preparations. Excessive doses are liable to cause symptoms of poisoning, which usually are the result of accident, and seldom prove fatal; it excites gastric pain and tenderness, with vomiting, followed by well-marked jaundice, in every case that has fallen under my observation. The ordinary medical doses, when long persevered in, are alleged to induce atrophy of the breasts and testicles. These must be of rare occurrence. I have seen only one patient in whom the breasts became obviously diminished, and at the same time menstruation almost ceased. The febrile symptoms, emaciation, hectic, and diarrhœa, termed iodism, are still more uncommon, and are only likely to happen through gross negligence. Soon after iodine is taken it appears in the urine and saliva; its therapeutic effects are essentially alterative, that is, it promotes the metamorphosis of tissue, the elimination of effete matters, and subsequent healthy assimilation; being sparingly soluble in water, it is prescribed dissolved with iodide of potassium, and some consider its efficacy increased by copious dilution.

Iodine has been principally exhibited in diseases of the absorbent and glandular system, to disperse chronic indurations, and for strumo-syphilitic affections, particularly after mercurial treatment, or in cases where mercury is inadmissible; for late tertiary symptoms, nodes, rheumatic pains, and diseases of the bones, it proves of much service. The influence which it exerts in absorbing goitre first led to its introduction as a remedial agent; it is still considered the best and most successful mode of treatment; all thyroid tumours, however, are not goitrous, and therefore not equally amenable to the action of iodine. I have lately seen two well-marked cystic tumours in this region cured by tapping. Iodine dissolved in spirit with iodide of potassium is used topically; strong solutions are rubefacient and counter-irritant; they are painted over bubos, bursal effusions, chronic diseases of the bones or joints, and sometimes to destroy small nævi, and check the ulcerative action of lupoid and scrofulous sores. In goitre, the external use of iodine is generally recommended at the same time that it is prescribed internally. Dr. Churchill speaks in high terms of its efficacy in removing hypertrophy of the cervix uteri, and as a caustic for slight ulcerations of the womb. Weaker preparations are of service in aiding the absorption of morbid effusions, as in chronic pleurisy and synovitis, and to disperse glandular tumours, used in the form of liniment, or applied on lint. When prepared with glycerine, they continue long moist, which favours their action on the diseased part. Solutions containing iodine are constantly injected into cysts, chronic abscesses, and fistulas, to excite a degree of healthy inflammation in their walls, and have been used for treating ovarian tumours, empyema, affections of the joints, and large serous cavities; but the operation on parts of such magnitude can seldom be considered safe, and, if resorted to, it should be with extreme caution. Tincture of iodine diluted with one to three parts of water forms a well-known injection for the radical cure of hydrocele, the liquid being drawn off after a few minutes, so soon as it causes heat and pain; occasionally a few drops of the pure tincture are used, being permitted to remain within the cavity of the sac.

ANTIDOTE.—Farinaceous substances form an inert compound with iodine. Vomiting should be promoted.

DOSE.—One-fourth to half a grain, usually given in solution with iodide of potassium.

TINCTURA IODI.—TINCTURE OF IODINE.—Is of deep brown colour, staining the skin. Used to paint over tumours to promote their absorption, or added to liniments for scrofulous affections, &c.; it may also be given internally in doses of ten drops, gradually increased to thirty, properly diluted.

PREPARATION.—Iodine, ℥ss.; iodide of potassium, ¼ ounce; rectified spirit, Oj. Mix.

LINIMENTUM IODI.—IODINE LINIMENT.—Commonly termed iodine paint, is much valued as an energetic counter-irritant and absorbent; it is occasionally applied round erysipelatous eruptions, to limit their extension, and to the joints in gouty or rheumatic attacks, being considered to relieve the pain; in strumous individuals it aids in dispersing chronic swellings of the tonsils, painted directly on the gland; its other uses are mentioned under iodine.

Preparation.—Iodine, 1¼ ounce; iodide of potassium, ℥ss.; rectified spirit, f℥v. Mix.

UNGUENTUM IODI COMPOSITUM.—Compound Iodine Ointment.—Used to disperse chronic tumours, &c., like other iodine preparations.

Preparation.—Iodine, gr. xxxij.; iodide of potassium, gr. xxxij.; proof spirit, fʒj.; dissolve, and add prepared lard, ℥ij.

BROMINE (Br).—A liquid metalloid found in brine springs, as Kreuznach, and in sea water, in small quantity. It is dark red; very volatile, emitting dense red vapours, resembling chlorine in odour, which are highly irritating, irrespirable, and corrosive, and hence requires to be kept under a layer of water in a closed bottle. Bromine has sp. gr. 2·9; boils at 145°; freezes at -8°; it dissolves sparingly in water, more freely in alcohol or ether, and is expelled from its combinations by chlorine.

Preparation.—Bittern, the residue of sea water after obtaining salt, is subjected to a stream of chlorine, which sets free bromine from its union with magnesium; it is taken up with ether, potash added to form bromide and bromate of potassium; the salts crystallized and heated to low redness, until changed to bromide of potassium, from which bromine is got by a process similar to iodine.

Tests.—Its salts give white precipitates, with nitrates of silver and of lead. If a few drops of chlorine water are added to a bromide in solution, bromine is set free, and can be extracted with ether; with starch it strikes an orange colour.

Effects.—Pure bromine is caustic, and poisonous in large doses; its medical effects are supposed to be similar to those of iodine; it is used to prepare bromide of potassium, and the following

SOLUTION OF BROMINE.—Bromine will dissolve in thirty-three parts of water; its solution, by exposure to sunlight, decomposes, forming hydrobromic acid; it liberates iodine from its combinations, and is used in testing bromide of potassium.

Preparation.—Bromine, 10 minims; distilled water, f℥v.; dissolve by shaking in a well-stopped bottle (ordered only as a test solution).

BORON (Bo).—Is of interest in pharmacy, as the base of boracic acid, and therefore a constituent of borax. It can be obtained in three allotropic states—a dull green powder, in scales resembling graphite, and crystals as hard as the diamond.

BORACIC ACID (BO_3, 3HO).—Is got by dissolving borax in four parts of boiling water, and adding oil of vitriol, diluted with a little water; it crystallizes on cooling in pearly scales, without odour, and of slight taste, sparingly soluble in cold water; its alcoholic solution burns with a characteristic green flame. The great source of boracic acid is the lagoons of Tuscany, where it escapes, mixed with steam, from subterranean volcanic fires, and the heat, by ingenious plans, evaporates the watery solution; it is also got as borate of lime in Peru.

SOLUTION OF BORACIC ACID is used to test turmeric on the exterior of rhubarb root, causing with it a brown coloration.

PREPARATION.—Boracic acid, gr. xv.; rectified spirit, f℥j.

PHOSPHORUS (Ph).—This element is transparent and colourless when pure, having a slight garlic odour; it crystallizes in rhombic dodecahedrons; is brittle at 32°, and of waxy consistence at ordinary temperatures; it burns slowly in the air, becoming luminous, and forming phosphorous acid, PO_3; if inflamed, phosphoric acid, PO_5, results; at 110° it melts. Phosphorus exists in several allotropic states; the most interesting is red phosphorus, obtained by heating phosphorus in closed vessels, at a high temperature, for several hours, and dissolving out any unchanged particles; it is neither inflammable nor poisonous; may be freely exposed to air without igniting, and if raised to 500° returns to its ordinary state, evolving considerable heat. Ordinary phosphorus requires to be preserved in water; it is dissolved by ether and the fixed and volatile oils.

PREPARATION.—Superphosphate of lime, mixed with charcoal powder, and previously heated to dryness, is distilled at an intense heat, and the phosphorus which passes off condensed under water. The reaction will be $3(CaO, 2HO, PO_5) + 16C = PO_5, 3CaO + 2Ph + 6H + 16CO$.

EFFECTS.—Workmen exposed to phosphorus fumes in making matches are liable to a chronic disease of the jaw; it appears to commence by periosteal inflammation, is attended with tumefaction of the part and pain, and terminates in extensive necrosis, causing considerable deformity; fortunately, the risk of its occurrence is greatly diminished by proper ventilation and cleanliness. Phosphorus is a dangerous poison, in constant demand for destroying rats and other vermin, in the form of phosphorus paste, and accidents sometimes result from its incautious use; children, too, occasionally eat the tops of lucifer matches; and of late years attempts have been made to employ this substance for criminal purposes; it excites violent corrosive and irritant symptoms, which may not appear for several hours after taking the poison, and death does not usually occur for some days. Three or four grains of phosphorus dissolved in olive oil, fʒij., is used in paralytic affections, as an embrocation, and doses of three to ten drops given internally in epileptic and nervous diseases; but the evidences of its success are not satisfactory.

Antidotes.—None. Emetics should be administered, and afterwards magnesia and water, or copious draughts of oil, to dissolve the phosphorus.

PHOSPHORIC ACID (PO_5, $3HO$).—This acid exists in three conditions. The monohyrated acid, got by evaporating and fusing any of its modifications, is termed glacial phosphoric acid; it is deliquescent, intensely acid, but not caustic; precipitates albumen, and with nitrate of silver gives a curdy white precipitate. Bibasic phosphoric acid yields a crystalline white deposit with nitrate of silver, and has no action on albumen. The tribasic acid is officinal, and is contained in all the medical phosphates; it is recognised by giving a yellow precipitate with nitrate of silver, soluble in nitric acid and ammonia, is not corrosive, and can only be obtained in solution; if strongly heated, passing into the other phosphates.

ACIDUM PHOSPHORICUM DILUTUM.—**Dilute Phosphoric Acid.**—A colourless acid fluid, sp. gr. 1·08; if evaporated, it yields glacial phosphoric acid.

Preparation.—Phosphorus, 413 gr.; nitric acid, f℥iv.; distilled water, f℥x.; gently distil off f℥v. through a Liebig's condenser; return this, and redistil until all the phosphorus dissolves; place the contents of the retort in a porcelain capsule, and evaporate, raising the heat at the end until orange bubbles cease to escape, and a colourless liquid remains; when cold, add distilled water to make Oj.

Nitric acid and phosphorus yield binoxide of nitrogen, and phosphoric acid, $3P + 5NO_5 = 5NO_2 + 3PO_5$. The action should not be permitted to become over-violent.

Impurities.—The absence of nitric acid is shown by mixing this dilute acid with an equal volume of pure sulphuric acid, and pouring it into a solution of sulphate of iron; it should yield no dark discoloration. When tested with albumen, which precipitates monobasic phosphoric acid, there is no action. Lastly, fʒvj. added to litharge in fine powder, 180 grs., evaporated, and heated to dull redness, should leave a residue weighing 215·5 grs., the formation of this quantity of phosphate of lead showing that the acid is of full strength.

Test.—Tribasic phosphoric acid and its salts form a yellow precipitate with nitrate of silver, soluble in ammonia and nitric acid.

Effects.—A tonic, like other mineral acids, considered useful in arresting urinary phosphatic deposits, and added to water as a drink in diabetes.

Dose.—15 drops to fʒss., diluted, often prescribed with bitter infusions, or to dissolve strychnia.

SODIUM, or **Natrium** (Na), is a bluish-white metal, soft, malleable, and easily cut, soon tarnishing in the air, and requiring to be preserved in naphtha; it ignites if heated or thrown on warm water, burning with a bright yellow flame. When placed on a large surface of cold water, it decomposes it, evolving hydrogen, but not taking fire. Sodium is obtained by distilling a mixture of dried carbonate of soda, chalk, and charcoal, in the manner described for potassium.

Tests.—Soda salts burned with alcohol or the blowpipe have a distinctive yellow flame; minute traces are detected by the spectroscope affording a bright yellow band; its salts precipitate with metantimoniate of potash, in white crystals; they are best known by negative evidence from the other alkalies. Thus, they differ from potash in not precipitating with bichloride of platinum, and from ammonia by not giving an odorous gas when heated with lime. Most soda salts are efflorescent.

SODA CAUSTICA.—**Caustic Soda** (NaO, HO).—Hydrate of soda forms hard greyish-white fragments, opaque, strongly alkaline, and corrosive; it requires a red heat for fusion; its sp. gr., according to Filhol, is 2·13.

Preparation.—Rapidly boil down solution of soda in a clean iron or silver vessel until it yields an oily liquid, of which a drop removed on a heated rod will solidify; pour it on a clean iron plate, and when cold break into fragments, and keep in a closed green glass bottle.

Purity.—Dissolved in distilled water, and supersaturated with nitric acid, it yields scanty precipitates with chloride of barium and nitrate of silver, showing the comparative absence of sulphates and chlorides; forty grains dissolved in distilled water leave little sediment, and require about ninety measures of the volumetric oxalic acid solution for saturation.

Used for chemical purposes.

LIQUOR SODÆ.—**Solution of Caustic Soda.**—A solution of hydrate of soda, sp. gr. 1·047, containing about 3½ per cent. of soda, equivalent to the solution of potash in saturating power. fʒj. requires for neutralization forty-seven measures of the volumetric solution of oxalic acid.

Preparation.—Carbonate of soda, ℥xxviij.; distilled water, a gallon; dissolve; heat in a clean iron pot to boiling; gradually add slaked lime, ℥xij., stirring constantly, and boil for ten minutes; remove from the fire; let the insoluble parts subside; draw off the clear fluid with a syphon, preserving it in green glass bottles.

In this process the lime abstracts carbonic acid from the soda, and precipitates. $NaO, CO_2 + CaO, HO = NaO, HO + CaO, CO_2$.

Purity.—The absence of carbonate is shown by its not effervescing with dilute hydrochloric acid, or becoming turbid with lime water—and of lime, by remaining unaffected with oxalate of ammonia. When treated with excess of dilute nitric acid, and evaporated to dryness, the residue forms a clear solution in water; and its comparative freedom from chlorides and sulphates causes it to become only slightly turbid with nitrate of silver and chloride of barium.

Effects.—It is used for preparing the oxides of iron, valerianate of soda, and quinine, and given as an antacid, in doses of ten to thirty drops properly diluted.

SODII CHLORIDUM.—**Chloride of Sodium** ($NaCl$).—Is procured from rock-salt, brine springs, and sea water. The latter affords about 2·7 per cent., or nearly four ounces to the gallon, with sulphate and chloride of magnesium, and traces of bromine and iodine, which remain in solution as the salt crystallizes out; it forms colourless solid or hollow cubes or crystalline grains, unaltered in the air when pure, but attracting moisture if containing traces of chloride of magnesium. Salt dissolves in three parts of water; is nearly equally soluble at all temperatures; fuses at a red heat, and sublimes unchanged; sp. gr. 2·5.

Purity.—Chloride of barium gives no precipitate in solutions of salt if free from sulphates. Magnesia is tested by precipitating with phosphate of soda, after adding a mixed solution of ammonia and sal ammoniac.

Effects.—Chloride of sodium is given to counteract the effects of nitrate of silver, as a chemical antidote; in ℥ss. doses dissolved in warm water it operates as an emetic. It is sometimes used for intermittent fever, a practice said to be long followed in Hungary; for this purpose sixty grains are exhibited three or four times daily in solution during the intermission or apyrexial stage; and in some cases, observed by M. Piorry, the spleen was found rapidly to diminish in size during the treatment. Salt is often added to purgative enemas, and to destroy ascarides; and, dissolved in cold water, is used to arrest uterine hæmorrhage, and promote contraction of the uterus in cases of tedious labour, or flooding after delivery. A lotion of salt is applied to chronic and indolent ulcers, to stimulate them, and induce healthy granulations.

Artificial salt water for baths is made by dissolving rocksalt, lb.j., in water, three gallons.

LIQUOR SODÆ CHLORATÆ.—Solution of Chlorinated Soda.—($NaCl + NaO, ClO$).—A colourless fluid, with astringent taste and feeble chlorine odour, containing in solution hypochlorite of soda, chloride of sodium, and bicarbonate of soda, of sp. gr. 1·103; it bleaches test paper, and decolorizes solution of indigo. From its discoverer, it is termed Labarraque's disinfecting fluid.

Preparation.—Place in a glass vessel carbonate of soda, ℥xij., dissolved in distilled water, f℥xxxvj.; gradually pass in chlorine gas disengaged from a mixture of common salt, ℥iv., and binoxide of manganese, ℥iij., to which sulphuric acid, f℥ijss., is added, previously mixed with distilled water, f℥iij., and cooled, all contained in a retort. The chlorine, as it escapes, is to be washed by passing through distilled water, f℥v., in a bottle before entering the soda solution, and the process is continued as long as any gas forms. The resulting fluid requires to be kept cool, and closely stopped in a bottle.

The reaction from chlorine and carbonate of soda solution is the formation of hypochlorite of soda and chloride of sodium, the carbonic acid uniting with excess of soda to form a bicarbonate, $3NaO, CO_2 + 2Cl = NaO, ClO + NaCl + NaO, HO, 2CO_2$; for when dilute hydrochloric acid is added, both chlorine and carbonic acid are evolved.

Purity.—After adding hydrochloric acid, there should be no precipitate with chloride of barium, showing the absence of sulphates. If of full strength, fʒj., mixed with iodide of potassium, gr. xx.; distilled water, f℥iv.; and hydrochloric acid, fʒij.; require forty-three measures of the volumetric solution of hyposulphite of soda to discharge the brown colour. It yields no precipitate with oxalate of ammonia if free from traces of lime.

Effects.—It is prescribed internally in putrid affections, as malignant scarlatina, in cases of fœtid expectoration, and for gangrene of the lungs, and sometimes to correct offensive discharges from the bowels; added to gargles, it is much relied on in ulcerated sore throat, and venereal affections of the fauces; and some consider that it is of service for checking mercurial ptyalism. It is of use as an injection for relieving fœtid uterine secretions, and constantly employed in lotions to cancerous, syphilitic, and other foul ulcerations. All these applications depend on its deodorizing and disinfecting properties; and, volume for volume, it is ascertained that hypochlorous acid, ClO, is twice as effective in bleaching as chlorine, both its elements contributing to its activity; but as a deodorizer, chlorinated lime is usually preferred for its cheapness.

Dose.—Internally, twenty to thirty drops are given every three or four hours, largely diluted. For gargles and lotions, fʒij. to iij. of the solution will suffice for eight ounces of fluid.

CATAPLASMA SODÆ CHLORATÆ.—Chlorine Poultice.—An excellent application to fœtid and gangrenous sores, to remove their odour and afford moderate stimulation.

Preparation.—Add linseed meal, ℥iv., gradually to boiling water, f℥viij., stirring constantly; then mix in solution of chlorinated soda, f℥ij.

SODÆ HYPOSULPHIS.—**Hyposulphite of Soda.**—($NaO, S_2O_2 + 5\ HO$).—Forms large, odourless, semi-transparent, oblique prisms, of bitter sulphurous taste; it deliquesces in the air, but remains unchanged in composition; in solution it very slowly absorbs oxygen, depositing sulphur and becoming sulphate of soda. It is prepared by digesting solution of sulphite of soda on sulphur, and crystallizing, $NaO, SO_2 + S = NaO, S_2O_2$. This salt is largely employed in photography; it is officinal for forming a volumetric solution.

Test.—24·8 grains should decolorize 100 measures of the volumetric solution of iodine, forming iodide of sodium and tetrathionate of soda, two atoms of the salt being equivalent to one of iodine, $I + 2NaO, S_2O_2 = NaI + NaO, S_4O_5$.

Effects.—It appears to be of service in cases of chronic yeasty vomiting, accompanied by sarcinæ ventriculi, probably from evolving sulphurous acid; for this purpose it is prescribed in bitter infusions; but the affection is so often associated with pyloric disease, or other incurable changes, as frequently to be beyond medical aid. A strong solution of the salt, acidulated with acetic acid, is applied to destroy parasitic vegetative growth in cutaneous diseases, such as favus, porrigo decalvans, mentagra, and pityriasis versicolor; the affected part is either sponged with the lotion, or it is used on lint, which keeps it constantly moist; the difficulty of reaching the hair bulbs, and other lurking places of these cryptogamic vegetations, impairs its usefulness; by adding the acid, sulphur is set free, and an alkaline solution obtained of sulphurous acid.

Dose.—Twenty to thirty grains, taken thrice daily. For lotions, ℥ss. to ℥j., dissolved in eight ounces of water, to which acetic acid, f℥j., can be added.

SODÆ NITRAS.—**Nitrate of Soda.**—(NaO, NO_5). Cubic nitre is procured in an impure state from the surface of the soil in Peru, and recrystallized for use; it is a white salt, somewhat deliquescent in moist air, having a cool saline taste; soluble in three parts of cold water, and distinguished from potash nitre by giving a yellow flame if thrown on hot coals. It is used to prepare

SODÆ NITRIS.—**Nitrite of Soda.**—(NaO, NO_3). This substance is in opaque white fragments, soluble in water and rectified spirit, which latter property distinguishes it from any nitrate. Nitrites give a sparingly soluble white crystalline precipitate with nitrate of silver; and when a fragment of nitrite of soda is moistened with solution of sulphate of copper, it acquires a brilliant green colour, characteristic of this class of salts; tartaric acid, added to a strong solution, developes ruddy fumes, but gives no precipitate if free from potash.

Preparation.—Mix thoroughly nitrate of soda, lb.j., charcoal burned and in fine powder, 1½ ounce; drop the mixture in successive portions into a clay crucible heated to dull redness. When the salt has become quite white, raise the heat to liquefy it; pour it out on a clean flagstone, and when solidified break into fragments and keep in a stoppered bottle.

If the decomposition were perfect, the carbon would remove excess of oxygen, forming carbonic acid, $NaO, NO_5 + C = CO_2 + NaO, NO_3$; it is a mixture of nitrite of soda with caustic and carbonated soda, and some unchanged nitrate. Professor Apjohn states that it affords 25 per cent. of nitrite.

Used.—To prepare sweet spirit of nitre.

SODÆ PHOSPHAS.—Phosphate of Soda ($PO_5, 2NaO, HO + 24 Aq$), or tasteless purging salt, forms transparent rhombic prisms, terminated by four converging planes; colourless; of cool, saline taste, soluble in four parts of cold water, and efflorescing in the air.

Preparation.—Place bone ash, lb. x., in a capacious earthenware vessel; add sulphuric acid, f℥lvj., and stir with a glass rod till thoroughly moistened. After 24 hours add gradually distilled water, a gallon, constantly stirring. Digest for 48 hours, adding distilled water from time to time, to replace what has evaporated. Add another gallon of the water, stirring, and digest for an hour. Filter through calico, and wash what remains on the filter with successive portions of distilled water till it almost ceases to have an acid reaction. Concentrate the filtrate to a gallon; let it rest 24 hours, and filter again. Heat the filtrate near boiling. Add carbonate of soda, ℥xvj., dissolved in two gallons of distilled water, till it ceases to form a precipitate, and the fluid acquires a feeble alkaline reaction. Filter through calico. Evaporate the clear liquor till a film forms on the surface, and crystallize. The mother liquid, by evaporating, will yield more crystals, a little carbonate of soda being added, if necessary, to keep it alkaline. Dry the crystals rapidly without heat on filtering paper or porous bricks, and keep in stopped bottles.

The bone ash and sulphuric acid form insoluble sulphate of lime and superphosphate of lime, which is washed out, $PO_5, 3CaO + 2SO_3, HO = 2CaO, SO_3 + PO_5, CaO, 2HO$. To the latter, in solution, carbonate of soda being added, a precipitate results of phosphate of lime, and the phosphate of soda dissolves and is crystallized, $3 (PO_5, CaO, 2HO) + 4NaO, CO_2 = PO_5, 3CaO + 2 (PO_5, 2NaO, HO)$, the salt usually combining with 24HO in crystallizing.

Purity.—Heated to dull redness, it loses sixty-three per cent. of its weight, leaving a residue of bibasic phosphate, or pyrophosphate, $PO_5, 2NaO$, which, dissolved in water, gives a precipitate with chloride of barium, soluble in dilute nitric acid.

Test.—With nitrate of silver this tribasic phosphate forms a yellow precipitate, and the solution reacts acid, $PO_5, 2NaO, HO + 3AgO, NO_5 = PO_5, 3AgO + 2NaO, NO_5 + NO_5, HO$. If a solution of magnesia, and afterwards ammonia, is added to a soluble tribasic phosphate, the insoluble ammoniaco-magnesian phosphate deposits, $NH_4O, 2MgO, PO_5$, which is a common constituent of urinary calculi, and constitutes the well-known triple phosphate sediment.

Effects.—This salt is prescribed in small doses much diluted for lithic acid sediments, as ten to twenty grains, three or four times in the day. From ʒss. to ℥j. operates as a mild saline aperient, well adapted for children and delicate persons, its taste being concealed by veal or chicken broth.

SOLUTION OF PHOSPHATE OF SODA.—Employed in qualitative analysis to test magnesia in presence of ammonia, with which it forms triple phosphate; and also to precipitate lithia.

Preparation.—Of the salt in crystals, ℥j.; distilled water, fʒviij.; dissolve, and make up to fʒx. with distilled water.

SODÆ ARSENIAS.—**Arseniate of Soda** ($2NaO, HO, AsO_5 + 14 HO$).—This salt is isomorphous with the corresponding phosphate of soda, and, like it, can be got with fourteen or twenty-four HO, according to the temperature of the solution it crystallizes from; it forms colourless transparent prisms, which dissolve in water, yielding an alkaline solution. Heated to 300°, it loses 40·38 per cent. of its weight; it gives white precipitates with chloride of barium, chloride of calcium, and sulphate of zinc, and a brick-red with nitrate of silver, all distinctive reactions of arsenic acid, and soluble in nitric acid.

Preparation.—Powder separately arsenious acid, ʒx.; nitrate of soda, ℥viijss.; dried carbonate of soda, ʒvss., and mix in a porcelain mortar. Then place in a large clay crucible covered with a lid, and expose to full red heat till all effervescence ceases and complete fusion has taken place. Pour the fused salt on a clean flag, and when solid and still warm put it in boiling distilled water, fʒxxxv., stirring constantly. When it dissolves, filter and crystallize. Drain the crystals, dry rapidly on blotting paper, and keep in closed bottles.

The arsenious acid is oxidized by the nitric acid, binoxide of nitrogen escaping. It subsequently unites with the soda, expelling carbonic acid, and the resulting salt is crystallized from the hot water.

Purity.—Heated to 300°, ten grains of the residue dissolved in water, treated with 5·3 measures of the volumetric soda solution, continue to give a precipitate with the volumetric solution of nitrate of silver until 161·3 measures of the latter are added.

Effects.—Its action internally is similar to that of all soluble arsenical preparations; some consider it less irritating than the salts of arsenious acid, believing that its isomorphous relations with phosphoric acid, which is a constituent of the human body, explains this milder therapeutic effect. It is used in chronic cutaneous eruptions, as psoriasis and eczema, and for periodic diseases; it is also employed to prepare arseniate of iron.

Dose.—$\frac{1}{30}$th to $\frac{1}{16}$th of a grain in pill or solution, thrice daily.

LIQUOR SODÆ ARSENIATIS.—**Solution of Arseniate of Soda.**—The salt in this preparation is rendered anhydrous to secure uniformity of composition; it has long been given, under the name of Pearson's solution, for cutaneous eruptions; compared with the solution of arsenite of potash, the amount of metallic arsenic is found to be in the proportion of 99 to 186, or 1 to 2.

Dose.—Four to ten drops, thrice daily.

Preparation.—The salt, rendered anhydrous by a heat not exceeding 300°, gr. iv.; distilled water, f℥j. Dissolve.

BORAX.—**Biborate of Soda** ($NaO, 2BO_3 + 10HO$).—Is procured in large transparent six-sided prisms, having a weak alkaline taste, slightly efflorescent, and free from odour; soluble in twelve parts of cold, or two of boiling water, and insoluble in rectified spirit; it fuses at a red heat into a glassy mass. When crystallized between 174° and 133°, it affords octohedrons containing 5HO.

Preparation.—Borax is got by decomposing borate of lime obtained in Peru; by recrystallizing the crude borax of Tibet termed tincal; and chiefly from the borax lagoons of Tuscany, where boracic acid rises in vapour from subterranean fires, and is condensed in the water, which is also evaporated by the heat thus obtained, soda being added to yield borax.

Test.—Its solution deposits boracic acid on the addition of a mineral acid, which burns in spirit with a green flame.

Adulterations.—None. 191 grains dissolved in distilled water, f℥x., require for saturation 100 measures of the volumetric oxalic acid solution.

Effects.—Borax is used in gargles, or mixed with honey, for ulcerated sore throat, and the aphthæ of children; in lotions it relieves prurigo and erythematous rashes; and Pereira found it of great value in pityriasis versicolor; it also forms a useful addition to tepid baths, in the treatment of eczema when extensive. It is prescribed in vaginal injections for acrid uterine discharges, and when taken internally is supposed to exert a special influence over the uterus, promoting menstruation, and favouring the expulsion of the placenta after delivery; its effects, if any, are slight; for uncomplicated infantile diarrhœa, M. Bouchut recommends enemata composed of a quarter to half an ounce of borax in water, f℥iv., as particularly efficacious. Dissolved in glycerine, it is a favourite application to chapped lips and fissures of the nipple.

Dose.—Fifteen to thirty grains, thrice daily. For lotions, ℥ss. in ℥viij. of fluid.

SODÆ CARBONAS.— Carbonate of Soda $(NaO, CO_2 + 10\,HO)$.—Washing or sal soda forms large oblique rhombic crystals, translucent, and free from odour, tasting unpleasantly alkaline; efflorescing in dry air, and soluble in two parts of cold water.

Preparation.—Soda is procured from the ash of sea weed or kelp, and from barilla, the residue after burning plants grown near the sea shore. In practice all the soda of English commerce is got from salt by Leblanc's process, which is converted into sulphate of soda by sulphuric acid.

Sulphate of soda, mixed with chalk and small coal, is thrown in repeated portions into a reverberatory furnace, and stirred till melted. After fusion the *ball soda*, or *black ash*, contains from 20 to 27 per cent. of soda, which is dissolved out by water, and crystallized. The process yields carbonate of soda and sulphide of calcium, which, uniting with more lime, forms an insoluble oxysulphide of lime, $2\,NaO, SO_3 + 3\,CaO, CO_2 + 4\,C = 2\,NaO, CO_2 + 2\,CaS + 4\,CO_2$, the $2\,CaS$ uniting with CaO to produce a slag.

Purity.—Its comparative freedom from sulphate or chloride of sodium is shown by its solution, when supersaturated with nitric acid, precipitating slightly, or not at all, with chloride of barium or nitrate of silver; 143 grains require, for neutralizing, about 96 measures of the volumetric solution of oxalic acid. By heat it fuses, losing sixty-three per cent. of its weight.

Test.—On adding an acid, carbonic acid is expelled with effervescence.

Effects.—Carbonate of soda is used in lotions for cutaneous eruptions; for this purpose, weak solutions are preferable; thus, chronic eczema often improves with a dilute soda wash, kept constantly applied on lint; in recent psoriasis, when the skin is irritable, and for pruriginous affections, baths in which soda is dissolved are of benefit; solution of soda also forms a useful addition to poultices for softening and detaching crusts and scabs. This salt is occasionally employed for preparing effervescing draughts, thirty-six grains saturating f℥ss. of lemon juice.

Dose.—Half a pound, or upwards, suffices for a twenty-gallon bath; for lotions, 60 to 120 grains in half a pint of water.

SODÆ CARBONAS EXSICCATA.—Dried Carbonate of Soda.—A white powder, having the chemical properties of the crystallized salt. This can be got with less trouble by heating the bicarbonate of soda to redness, as proposed by Mr. H. Draper.

Preparation.—Heat carbonate of soda, ℥viij., in a porcelain capsule, with a rather strong sand heat, until the liquid first formed is converted into a dry cake. Powder, and preserve this in a stoppered bottle.

Effects.—Given to children as an alterative, combined with aperients, as rhubarb; and to correct acidity of stomach; it is less used in urinary diseases than the preparations of potash, and considered of minor value; possibly potash is excreted more readily through the kidneys, whilst soda salts are retained in the system.

Dose.—Three to eight grains, in pill or powder.

SODÆ BICARBONAS.—**Bicarbonate of Soda** $(NaO, HO, 2\,CO_2)$.—Bread soda is a white powder, of alkaline taste and reaction; soluble in fifteen parts of cold water; when dissolved in boiling water, it loses a part of its carbonic acid; and at a red heat yields very pure dry carbonate of soda; it can also be got in small opaque irregular scales.

Preparation.—Carbonate of soda, lb. ij., dried carbonate of soda, lb. iij. are well triturated together, and filled into a bottle fitted with a cork, through which passes a glass tube nearly to the bottom of the bottle. Fragments of white marble, lb. iv., are placed in a tubulated bottle, having a few small holes drilled in the bottom. This is tightly connected by bent tubes and corks with an empty two-necked bottle, and this again with the bottle holding the soda. On immersing the bottle with the marble in hydrochloric acid, one gallon, diluted with water, two gallons, carbonic acid passes over until the entire apparatus is filled with it. The cork is now tightly fitted into the soda bottle, and the action permitted to continue so long as carbonic acid is taken up. The resulting damp salt is agitated occasionally for half an hour with half its weight of cold distilled water, the undissolved portion drained, and dried by exposure to the air on filtering paper placed on porous bricks.

By this process of Mohr's the carbonate is converted into bicarbonate, by absorbing carbonic acid. The amount of water set free is diminished by the use of so much dried soda, and any more soluble carbonate is removed in the washing.

Purity.—In commerce it is often found to contain large quantities of chloride of sodium, and sulphate and carbonate of soda. Its comparative goodness is shown by its solution scarcely precipitating with nitrate of silver or chloride of barium, when supersaturated with nitric acid; 84 grains, exposed to a red heat, leave 53 of an alkaline residue of dry carbonate of soda, requiring 100 measures of the volumetric oxalic acid solution for saturation.

Test.—It effervesces with acids, and when free from carbonate of soda will not give a reddish-brown precipitate with corrosive sublimate.

Effects.—This salt, from its comparatively mild taste, is much used to relieve pyrosis, for which purpose it is best given an hour or so after meals, and is often combined with bismuth; the relief afforded is temporary, whilst bitters and mineral acids prescribed before meals will generally correct the disordered condition on which the pyrosis depends. It forms the ordinary alkaline constituent of effervescing draughts for allaying febrile heat and thirst, and for saline mixtures, in which it serves as a vehicle for more active remedies, as bark; for this purpose twenty-one grains of the bicarbonate will saturate f℥ss. of lemon juice, or eighteen grains of citric or tartaric acid; the resulting citrate or tartrate becomes decomposed in the system, the soda passing off by the kidneys as carbonate; hence, Prout observed the excessive use of such draughts exerted an injurious influence in phosphatic urinary deposits. In diphtheria, a strong solution of bicarbonate of soda is probably as effectual for removing the exudation as anything else; it has no influence over the course of the disease.

Dose.—Twenty to sixty grains.

SODÆ ET POTASSÆ TARTRAS.—Tartrate of Soda and Potash (KO, NaO, $C_8H_4O_{10}$ + 8 HO).—Rochelle salt, also termed Sel de Seignette, from being formerly made at Rochelle by Seignette, a chemist, is a fine white powder, of mild saline, rather bitter taste; it dissolves in two parts of cold, or less of boiling water, and crystallizes in colourless right-rhombic crystals, often forming hemihedral prisms; if heated with sulphuric acid, it blackens, evolves inflammable gases, and gives off the odour of burnt sugar.

Preparation.—Carbonate of soda, ℥xij.; boiling distilled water, Oiv.; dissolve; add gradually acid tartrate of potash in powder, ℥xvj., or sufficient to yield a neutral solution after boiling for a few minutes. Filter; concentrate until a pellicle forms on the surface, and set aside to crystallize. More crystals may be obtained by evaporating the mother liquid.

The basic atom of water in acid tartrate of potash is replaced by soda; carbonic acid is set free, and dissolves in the solution until expelled by subsequent boiling, $KO, HO, C_8H_4O_{10} + NaO, CO_2 = CO_2 + KO, NaO, C_8H_4O_{10}$.

Purity.—Forty-seven grains heated to redness, until gases cease to be evolved, leave an alkaline residue, requiring thirty measures of volumetric solution of oxalic acid for neutralizing.

Test.—A crystalline precipitate of acid tartrate of potash is got by adding a small quantity of sulphuric acid to a strong solution of this salt.

Effects.—In doses of sixty grains to ℥ss. Rochelle salt is prescribed as a mild aperient, with vegetable bitters, or infusion of senna, and forms the active constituent of Seidlitz powders, now gradually falling into disuse. In small repeated doses of thirty to sixty grains, well diluted, it becomes absorbed, and passes off through the kidneys, in the form of carbonates of potash and soda; hence it is employed in deposits of lithic acid to correct the acidity of the urine, and as an eliminating agent for rheumatic affections.

SODÆ ACETAS.—Acetate of Soda ($NaO, C_4H_3O_3 + 6HO$).—Is obtained in white, foliated masses or oblique rhombic crystals, which effloresce in dry air, losing one-third in weight; it should react neutral, and tastes saline and slightly bitter; is soluble in three parts of cold, or one of boiling water, and at red heat becomes changed into carbon and carbonate of potash.

Preparation.—Neutralize commercial acetic acid with carbonate of soda, and evaporate.

Used.—To prepare glacial acetic acid, and in the formulas for phosphate and arseniate of iron. Given internally, its effects are similar to those of acetate of potash.

SOLUTION OF ACETATE OF SODA.—Used in testing precipitated phosphate of lime, to replace free nitric acid by acetic acid.

Preparation.—Of the salt, ℥ss.; distilled water, f℥v. Dissolve.

POTASSIUM (Ka).—A soft sectile metal, of silver-white colour; so inflammable, that it requires to be preserved in pure naphtha; with water it bursts into a violet flame, forming potassa, and giving off hydrogen; it is obtained by strongly heating a mixture of carbonate of potash and carbon in an iron vessel, and receiving the metal which distils off in naphtha; it requires to be purified by redistilling the product.

Tests.—Tartaric acid, added in excess to strong solutions of the potash salts, precipitates a crystalline deposit of cream of tartar. Bichloride of platinum, with a salt of potash, acidulated with hydrochloric acid, deposits the double chloride of platinum and potassium, $KCl, PtCl_2$; this is decomposed by a red heat, leaving metallic platinum and chloride of potassium as a grey deposit.

POTASSA CAUSTICA.—Caustic Potash (KO, HO).—The hydrate of potash, or lapis infernalis, so termed from its powerful effects as a caustic, is sold in hard white sticks, very deliquescent, and strongly alkaline; if moistened, it feels soapy, from dissolving the tissues; at a low red heat it fuses into an oily fluid, and volatilizes at a higher temperature unchanged.

Preparation.—Rapidly boil down solution of potash, Oij., in a silver or clean iron vessel, till all ebullition ceases, and an oily fluid remains. Pour this into proper moulds; and when it has solidified, and is still warm, put it into stoppered bottles.

Impurities.—Traces of chlorides or sulphates will precipitate with solutions of nitrate of silver and of chloride of barium; there is often some iron dissolved, which tinges the sticks of a greenish hue; but its impurities interfere little with its use. If of average strength, fifty-six grains dissolved in water leave only a trace of sediment, which is silica, and require for neutralizing at least ninety measures of the volumetric solution of oxalic acid.

Effects.—Used as a caustic to destroy the edges of lupoid ulcers, and, by removing the diseased part, excite healthy granulations; also for uterine diseases; thus Dr. Bennett applies this caustic over ulcers of the cervix, having previously guarded the os uteri with a touch of nitrate of silver; when the tissues are hypertrophied and indurated, he relies on establishing a limited eschar, which acts beneficially, as he states, by the subsequent inflammation that is set up. Dr. Simpson prefers destroying the hypertrophied part, and protects the vagina from dangerous contact with the potash, by filling the lower portion of the speculum with vinegar, and afterwards syringing it freely. It is asserted that this practice is not safe, being liable to injure the vagina, to perforate its walls, and to excite peritonitis and ulcers; hence, some prefer the milder and more manageable caustic, potash with lime, whilst Dr. Churchill never finds it necessary to use either. Potash is chiefly of service for making issues; for this purpose, two or three layers of adhesive plaster are laid over the part, having a hole cut in them smaller than the proposed issue; the stick of potash, so protected by lint as not to injure the operator, is rubbed to the slightly-moistened skin until it becomes discoloured; the plaster is removed, oil freely applied, to prevent over-action of the caustic, and then poultices, until the slough becomes detached—usually in seven to twelve days—when the issue may be dressed with peas, or any irritating ointment, or kept open from time to time by light applications of the caustic potash. Issues are used to discharge deep abscesses in the pelvis, liver, &c., and promote the adhesion of their cysts to the cutaneous surface, if not already adherent; to open bubos, and especially those masses of indurated glands termed constitutional bubo which occur in persons of impaired health, and slowly suppurate. In scrofulous affections of the joints, an issue is sometimes most beneficial; and also for caries of the spine; it is necessary never to insert them over prominent bony points, as I have seen fatal results from pyæmia thus induced. Lastly, in amaurosis, threatened apoplectic attacks, and some chronic cerebral affections, an issue on the vertex is often of great service, more as a counter-irritant than from the trifling amount of discharge it excites. The chemical action of potash on the tissues is due to the formation of a soapy compound with albumen and fibrin.

POTASSA CUM CALCE.—POTASH WITH LIME.—Is not officinal, though much used; its properties are similar to caustic potash, but less energetic, and it is not so deliquescent. It is prepared by adding one or two parts of slaked lime to melted potash, and pouring it into moulds.

EFFECTS.—Dr. Tilt recommends it highly for treating diseases of the womb; in ulcerations of the cervix, he rubs it for ten to thirty seconds over the diseased part, according to the effect desired, protecting the neck of the womb near the speculum by thin pledgets of cotton wool, dipped in vinegar; and he subsequently applies a similar pledget to the slough, with a teaspoonful of laudanum added to it;

and insists on perfect repose for some time, as he admits that there is risk of acute abdominal pains ensuing, or menorrhagia, or pelvi-peritoneal inflammation, and possibly occlusion of the os uteri, which he ascribes to over-free use of the caustic, or to neglect during the treatment; at the same time he asserts that cases do occur in which this treatment is indispensable, as they resist milder measures; and especially he advises it for highly irritable ulcerations, with soft hypertrophy, that readily pour out a sanguineous discharge.

LIQUOR POTASSÆ.—Solution of Potash (KO, HO).—A colourless, odourless fluid; sp. gr. 1·058; strongly alkaline, and feeling soapy when rubbed to the fingers; it corrodes white glass containing lead, and must therefore be kept in green glass vessels, closely stopped, to prevent absorption of carbonic acid.

Preparation.—Dissolve carbonate of potash, lb.j., in distilled water, 1 gallon. Heat to boiling in a clean iron vessel, and gradually mix with it slaked lime, ℥xij., and boil for ten minutes, constantly stirring. Remove the vessel from the fire; and when the liquid clears by the insoluble matter subsiding, transfer it with a syphon to green glass bottles.

The slaked lime removes carbonic acid from the carbonate of potash, and subsides as carbonate of lime; this is greatly favoured by the boiling. The solution contains caustic potash. $CaO, HO + KO, CO_2 = CaO, CO_2 + KO, HO$. It may be obtained by simple agitation, as shown by Mr. Redwood.

Impurities.—Caustic potash readily absorbs carbonic acid; it should not effervesce with dilute acids, but will usually become turbid with lime water; oxalate of ammonia would detect traces of lime; treated with excess of nitric acid, evaporated to dryness, and re-dissolved in water, the solution is nearly clear, containing mere traces of chlorides or sulphates, as it precipitates little, if at all, with nitrate of silver and chloride of barium; and is rendered very slightly turbid with ammonia from some alumina.

Effects.—Concentrated solution of potash is occasionally taken through accident; it causes burning pain in the mouth and stomach, and rapid collapse, acting as a violent caustic, and may perforate the gastric walls; should the patient survive, he incurs risk of subsequent contraction of the esophagus or pylorus for many months afterwards.

According to Mialhe, alkalies diminish the plasticity of the blood. If medical doses of potash are given before meals, it passes off rapidly, combining with the sulphur of the tissues, forming sulphate of potash, which is found in the urine, and in this manner will act as an alterative and depurating agent; taken after meals, it combines with the acids of the stomach, being antacid; for the latter purpose it is prescribed with bitter infusions in dyspepsia, and for deposits of lithic acid in gouty patients. In cases where the urine is secreted acid, but decays subsequently, depositing phosphatic crystals, and exciting catarrh of the bladder, potash is capable of doing good service in careful hands; for these symptoms Vichy water may be employed, or it is used with buchu or pereira. For the strangury caused by blisters, or during severe attacks of gonorrhœa, liquor potassæ is a favourite remedy, given with abundance of diluents, or in almond emulsion. As an alterative, potash once bore a high reputation, under the name of Brandish's alkaline solution, and is still largely employed in the iodide of potassium, much of the efficacy of the salt depending on its potash element; it is used in scrofulous, glandular, and bony diseases, for mesenteric affections, and occasionally in full doses for acne, eczema, and sycosis, in decoction of elm bark or sarsaparilla. Potash is also considered to remove excessive obesity, when persevered in for a considerable time: its action, if any, must result from its eliminating effects on the system; it is absurd to ascribe it to the chemical solution of the fat.

Antidotes.—Lemon juice, vegetable acids, and oil.

Dose.—Ten drops to f℥j., every three or four hours, largely diluted.

POTASSII IODIDUM.—Iodide of Potassium (KI).—Crystallizes in shining cubes, generally white and opaque, though sometimes translucent, and often hollow, like those of common salt; of pungent saline taste, and free from odour; it should not deliquesce or alter in colour in dry air, and reacts neutral, though faintly alkaline when containing traces of potash. It is soluble in two-thirds its weight of cold water, and also dissolves in spirit; its solutions freely take up iodine; it fuses at a red heat, and can be volatilized unchanged.

Preparation.—Solution of potash, 1 gallon, is put in a glass or porcelain vessel; iodine, ℥xxix., or a sufficiency, gradually added till the solution has a permanent brown tint. The whole is evaporated to dryness in a porcelain dish, pulverized, and intimately mixed with finely powdered wood charcoal, ℥iij. The mixture is thrown, in small quantities at a time, into a red hot crucible, and, when the whole is fused, removed from the fire, and the contents poured out; when cool, dissolve in boiling distilled water, Oij.; filter through paper; wash the filter with a little distilled water; add the washings to the fluid, and evaporate all till a thin film forms. Set it aside to cool and crystallize; drain the crystals, and dry with gentle heat. More crystals may be got from the mother liquid.

By dissolving iodine with potash, iodide of potassium and iodate of potash result, $6\,KO + 6\,I = 5\,KI + KO, IO_5$. The heating with charcoal reduces the latter salt, leaving pure iodide of potassium, $KO, IO_5 + 6\,C = KI + 6\,CO$, carbonic oxide escaping with brilliant scintillations.

Purity.—The absence of iodate of potash is shown by adding tartaric acid and starch mucilage, which should develope no blue tint, iodide of potassium forming only hydriodic acid, $KI + C_8H_{10}O_4, HO = KO, HO, C_8H_{10}O_4 + HI$, whilst the iodate would disengage iodic acid, IO_5, the reaction of the two acids setting free iodine, and striking a blue colour. Traces of chlorides are tested by adding excess of solution of nitrate of silver; dissolving out from the yellow precipitate any chloride present by ammonia, and on adding excess of nitric acid, the chlorides afford an evident deposit in the fluid. Should iodide of potassium in solution render lime water turbid, it is due to the presence of some carbonate of potash.

Test.—Cold mucilage of starch gives a characteristic blue colour with iodide of potassium, a minute quantity of chlorine water being added to set iodine free; excess of chlorine is injurious, forming a colourless chloride of iodine; the colour is also destroyed by heating.

Effects.—When taken internally, iodide of potassium becomes absorbed, and passes off through different secretions, especially by the kidneys, and can be detected in the urine for some time afterwards. In certain individuals the smallest dose will disagree, exciting catarrh, soreness of the eyes, sneezing, and a sharp attack of bronchitis,—an idiosyncracy that, I have reason to know, may continue for years; it is also accused of causing nausea and diarrhœa, and if long continued in large doses, it is said to affect the tongue, enlarging and fissuring it. The assertion that if given after a mercurial course it will excite salivation, possibly to a dangerous extent, by setting free particles of that mineral from the tissues, requires further evidence before being received; it is certainly far from occurring so often as the statements on the subject would lead us to suppose.

This salt is a decided alterative, of extreme value in treating disease; it relieves periosteal and chronic rheumatic pains, whether arising from specific causes or uncomplicated with syphilis; in venereal affections it is frequently given after a mercurial course, and for late secondary symptoms, nodes, eruptions, ulceration of the throat, and sarcocele; those who decry the use of mercury, and attribute to its agency the production of severe constitutional maladies, rely on the iodide given from the earliest period as a safer mode of practice. Enormous doses have been taken, as thirty to sixty grains or more, three or four times in the day, but without any apparent advantage; from three to five grains well diluted will accomplish all the good results that can be hoped for, and with far less risk to the patient; nor does it seem judicious to persevere in this or any other alterative for a year or longer, as has sometimes been done; after a few weeks it should be discontinued, and again resumed, if required; its absorption is promoted by dissolving it in a quantity of fluid, and it is not then so liable to disagree with the stomach.

The iodide is constantly exhibited for chronic scrofulous affections, swellings of the joints, glandular enlargements, strumous corneitis, and cutaneous eruptions, which often are of peculiar obstinacy when occurring in scrofulous patients. Melsens recommends it for removing traces of mercurial and lead salts from the system in mercurial palsy and cases of lead colic; it is considered to render the salts soluble, and convey them from the body; but, as iodine forms no soluble compound with lead, it appears more likely that the benefit which results from this treatment is due to the alterative properties of the remedy, which is also useful in chronic poisoning by arsenic. Iodide of potassium is used in ointment for dispersing tumors and indurations of different kinds; it promotes the solubility of iodine, and is a constituent of most pharmaceutic preparations of that metalloid for external or internal use.

Dose.—Three to five grains, in solution; as already stated, much larger doses are employed by some practitioners.

UNGUENTUM POTASSII IODIDI.—Ointment of Iodide of Potassium.—Much used to promote absorption in indolent tumors and chronic local diseases; it is liable to become discoloured, if long kept, the lard turning rancid, and decomposing the salt. It may be applied with friction, or on lint as a dressing.

Preparation.—The iodide, 64 grains; dissolve in distilled water, and add lard, ℥j. Mix.

SOLUTION OF IODIDE OF POTASSIUM.—Employed for testing; it precipitates the salts of lead yellow, the subsalts of mercury green, and the salts of mercury red, the latter redissolving in excess of the solution.

Preparation.—The iodide, ℥j.; distilled water, f℥viij. Dissolve, and add more water to make up f℥x.

SOLUTION OF IODATE OF POTASH (KO, IO_5).—Used for analysis, to detect traces of mineral acids in acetic acid. Morphia also decomposes iodic acid, setting free iodine.

Preparation.—Iodine, chlorate of potash, of each fifty grains; rub to fine powder; place in a Florence flask; add distilled water, f℥ss., acidulated with nitric acid, five minims, and digest at a gentle heat till the colour of the iodine disappears. Boil for one minute, and transfer the fluid to a capsule, and evaporate to perfect dryness at 212°. Finally, dissolve the residue in distilled water, f℥x.; filter, and keep in a stoppered bottle.

In this process of Millon's the nitric acid liberates a little chloric acid, which is deoxidized by iodine, forming iodic acid and chlorine that escapes; the iodic acid sets free more chloric acid, and the transference continues till the change is accomplished, the evaporation expelling all traces of chlorine and nitrous fumes.

POTASSII BROMIDUM.—Bromide of Potassium (KBr).—Crystallizes, like the iodide, in white cubes; it has a saline acrid taste, dissolves freely in water, is less soluble in spirit, and at a red heat fuses without decomposing.

Preparation.—Place solution of potash, Oij., in a glass or porcelain vessel; add bromine, f℥iv., in successive portions, with constant agitation, until the liquid acquires a brown tint. Evaporate to dryness; reduce the residue to fine powder, and mix intimately with wood charcoal in powder, ℥ij. Throw the mixture in small quantities into a red hot iron crucible; and when the whole has been brought to a state of fusion, remove the crucible from the fire, and pour out its contents; when the fused mass has cooled, dissolve in boiling distilled water, Ojss. Filter through paper, and crystallize. Drain and dry the crystals with a gentle heat. More crystals can be got by evaporating the mother liquor.

The reaction is similar to that for preparing the iodide, substituting bromine for iodine.

Purity.—Gr. x. require eighty-four measures of the volumetric solution of nitrate of silver for complete decomposition, forming white bromide of silver; an excess would denote the presence of chlorides. The absence of iodine is shown by a solution of this salt, to which a drop of aqueous solution of bromine is added, giving no blue colour with mucilage of starch.

Test.—Dissolved in water, mixed with a little chlorine, and agitated with ether, the ether becomes red from free bromine.

Effects.—In ointment, it is considered to act like iodide of potassium, dispersing tumors and chronic indurations. M. Huette found that given internally it causes anæsthesia of the fauces, and diminished cutaneous sensibility, lasting for some time; hence, it has been recommended to lessen the irritability of the throat to laryngoscopic examinations; exhibited in small repeated doses, it is also alleged to relieve painful priapism from gonorrhœa, and to have decided anaphrodisiac powers. In hysterical epilepsy, or where the attacks are connected with menstruation or uterine derangements, Sir C. Locock has employed this salt with decided advantage; it has succeeded with Dr. C. B. Radcliffe, more or less, in cases depending on causes the most dissimilar in character; and Dr. M'Donnell, of this city, considers it to possess remarkable efficacy in the class of fits described by Sir C. Locock, and possibly when epileptiform seizures are traceable to sexual excesses.

Dose.—M. Huette gave as much as ʒv. in the day; by Sir C. Locock ten grains are given thrice daily for months; and Dr. M'Donnell uses thirty to forty grains for a dose, or even more. To produce anæsthesia of the fauces, five to twenty grains may be taken an hour or two before operating.

POTASSA SULPHURATA.—**Sulphurated Potash** ($3\,KS_3 + KO, SO_3$).—Liver of sulphur, or hepar sulphuris, is a mixture of tersulphide of potassium with sulphate of potash; when fresh, it is liver-brown, becoming greenish by keeping; it is inodorous in dry air; tastes alkaline and acrid, and freely evolves sulphide of hydrogen when dissolved in water. Exposed to the air, it gradually absorbs oxygen and water, and becomes white, losing its smell and medical properties.

Preparation.—Mix carbonate of potash in powder, ℥x.; sublimed sulphur, ℥ivss., in a warm mortar; and having placed them in a Hessian or

Cornish crucible, heat gradually till effervescence ceases, and finally to dull redness, until perfectly fused. Pour the liquid on a clean hearthstone; cover with an inverted porcelain basin, to exclude the air; and when cold break into fragments, and preserve in stoppered green glass bottles.

By melting sulphur and carbonate of potash, the carbonic acid escapes, tersulphide of potassium and sulphate of potash resulting, $4\,KO, CO_2 + 10\,S = 3\,KS_3 + KO, SO_3 + 4\,CO_2$. The tersulphide is its active constituent; when dissolved in water, it forms a solution of potash, precipitates sulphur, and evolves sulphuretted hydrogen, $KS_3 + HO = KO + S_2 + HS$.

Purity.—Rectified spirit dissolves about three-fourths of its weight, consisting of tersulphide of potassium.

Tests.—The presence of sulphate of potash is shown by its precipitating with chloride of barium. With acids it freely evolves sulphuretted hydrogen.

Effects.—Much employed in lotions for cutaneous eruptions, as pityriasis and psoriasis, from its local action as an irritant; and also in some parasitic vegetative diseases, as mentagra, on account of the effect which sulphurous preparations exert in destroying the vitality of such lowly organized growths. The SULPHUR BATH is prepared by dissolving ℥iv. of the salt in fifteen to twenty gallons of warm water; it is much used in treating chronic eruptions, psoriasis, eczema, prurigo, &c., and for old rheumatic pains; it has also been recommended to aid the elimination of lead from the system in saturnine poisoning; the patient's skin becomes quite blackened from its action, and the baths are persevered in so long as this is perceptible. The GELATINOUS SULPHUR BATH, an imitation of Bareges water, is got by adding glue, lb.j., dissolved in water, to the sulphur bath; it adds little to its effects. Large doses act as an irritant and narcotic poison, causing intense pain in the mouth and stomach, vomiting, faintness, insensibility, and convulsions, from the combined effects of the potash and sulphuretted hydrogen. Death has ensued within fifteen minutes after taking ℥ss. of the salt.

Antidotes.—Dilute solutions of chlorinated lime or soda, to decompose the sulphuret; with mucilaginous drinks and emetics, given as soon as possible.

Dose.—For lotions, 60 to 120 grains suffice for water, Oj.; it is useful only when recently prepared.

POTASSÆ BISULPHAS.—Bisulphate of Potash ($KO, HO, 2\,SO_3$).—Is got as a residue in making nitric acid, in an impure state, and can be crystallized in anhydrous acicular prisms of very acid taste; freely soluble in water; it used to be employed as a mild purgative, and is officinal for preparing the sulphate.

POTASSÆ SULPHAS.—Sulphate of Potash (KO, SO_3).—Formerly termed sal polychrest; is obtained in hard, white, odourless crystals, which are single or double six-sided pyramids, with a short prism between them; it tastes saline and bitterish; is unaltered in the air, and requires sixteen parts of cold water to dissolve in; it is insoluble in spirit.

PREPARATION.—The residue of the nitric acid process, lb.j., is dissolved in boiling distilled water, half a gallon; slaked lime, ℥viij., gradually added, until reddened litmus paper immersed in it is restored to a blue colour; the solution filtered through calico, heated to the boiling point, and carbonate of potash added so long as there is any precipitate. After again filtering, dilute sulphuric acid is added until the solution is neutral, or slightly acid, and then evaporated till a film forms, and crystallized, being set aside for twenty-four hours. The crystals are dried on blotting paper.

From the residue of nitric acid, consisting of impure bisulphate of potash, the lime removes the excess of acid, precipitating as sulphate of lime. To get rid of any lime remaining in solution, carbonate of potash is added, and this again exactly neutralized, if requisite, by dilute sulphuric acid, to obtain a chemically pure salt. The same result might be obtained by neutralizing the bisulphate with carbonate of potash.

IMPURITY.—Traces of the bisulphate would react acid to test paper, or of lime would precipitate with oxalate of ammonia.

EFFECTS.—It enters into the composition of Dover's powder. In doses of ten to sixty grains it acts as a gentle aperient, being usually prescribed in solution with rhubarb or aloes, and considered particularly useful in dyspeptic and hepatic affections, and in the gastric attacks of children. In France it has the reputation of repressing undue lactation after delivery. Large quantities, as ℥j. and upwards, cause all the symptoms of irritant poisoning, and even a quarter ounce has produced vomiting and purging resembling cholera, and rapidly ending fatally.

DOSE.—As stated, ten to sixty grains; the larger doses should always be given, fully dissolved in water.

POTASSÆ NITRAS.—NITRATE OF POTASH (KO, NO_5).—Commercial saltpetre, or nitre, is principally obtained from India, where it rises on the soil as an efflorescence in dry weather; it is produced by the traces of nitric acid and of ammonia that fall with rain from the atmosphere, the latter yielding nitric acid and water by oxidation, in which process the earth appears to act as a determining or catalytic agent; the acid combines with potash and lime, always present in the ground; and by dissolving out these salts in water, and filtering with wood ashes, the nitrate of lime is changed into an additional quantity of nitrate of potash; when crystallized, it is still impure, and is sold allowing for so much per cent. of "refraction," or extraneous salts.

Nitre forms long striated six-sided prisms with dihedral summits; of cooling saline taste; soluble in four parts of cold, or one-half part of boiling water, and insoluble in alcohol; it fuses at 642°, and when cast into balls or tablets is known as sal prunelle; at a red heat it is reduced to a nitrite, and, like all nitrates, deflagrates on hot coals.

Purified Nitre.—Preparation.—The nitrate of potash of the Pharmacopœia is got by dissolving commercial nitre, lb. iv., in boiling distilled water, Oij. On withdrawing the heat, and constantly stirring as it cools, the nitre is got in minute granular crystals; as much of the uncrystallized solution as possible is separated by decanting and draining, and the crystals washed in a percolator of glass or earthenware with distilled water, Oiij., or until the washings cease to precipitate with solution of nitrate of silver. The salt is then dried in an oven.

The impurities—chlorides, sulphates, &c., of lime, magnesia, and soda, are soluble in a saturated solution of nitre, and removed by washing; hence, pure nitre should not precipitate with nitrate of silver or chloride of barium.

Tests.—Its reactions are those of a nitrate and of a potash salt.

Effects.—Nitre is used to prepare nitric acid. It acts as a diaphoretic in moderate doses, and is often prescribed for mild febrile and inflammatory attacks, added to solution of acetate of ammonia, or to saline effervescing mixtures. When combined with diuretic infusions, as broom top, it stimulates the kidneys; and though less to be relied on than acetate of potash, is useful in treating dropsies, and increasing the quantity of urine. As the solution of nitre in water causes considerable cold, twenty to forty grains of the salt, recently dissolved, are occasionally given to arrest hæmorrhages from the lungs or stomach, by its refrigerating effects; and a cold application for external use can be prepared by dissolving nitre and sal ammoniac in fragments, of each, ℥v.; in water, Oj.; this freezing mixture lowers the temperature 40° during the solution of the salts. Nitre is also sometimes added to gargles for inflamed sore throat, but its advantages are trifling, and its taste unpleasant.

In acute rheumatism the administration of nitre in free doses is an old practice, which was re-introduced some years since by M. Gendrin; he commences with a quarter to half an ounce, dissolved in barley water, Oij., or iij., used for the ordinary drink during the day, and gradually increases the quantity, until ℥j., or ℥jss. is taken daily; it sometimes causes smart purging, more often diuresis or sweating ensues, and the pains are occasionally relieved to a marked extent within six to ten days; still, like all specifics as yet proposed for acute rheumatism, it too often fails altogether.

Those large quantities are safe only when diluted; given in a strong solution they cause dangerous symptoms, unless soon ejected by vomiting; the effects resemble cholera, and giddiness, convulsions, and insensibility have resulted; death has taken place within two hours after swallowing ℥jss. In one instance I have known severe gastric pain to recur after every meal for years, from the effects of a single large dose taken accidentally.

Antidotes.—None. Emetics or the stomach pump should be used, and afterwards mucilaginous fluids; the subsequent gastric inflammation being treated on general principles.

Dose.—Ten to sixty grains for a diaphoretic, or diuretic. **Nitre whey**, a popular remedy in catarrhs and feverish colds, is prepared by dissolving sixty to ninety grains of nitre in a pint of warm whey.

POTASSÆ CHLORAS.—**Chlorate of Potash** (KO, ClO_5).—Crystallizes in colourless brilliant rhomboidal plates; of cool saline taste; soluble in ten parts of cold, or two of boiling water; rubbed in the dark, the crystals become luminous; they deflagrate if thrown on hot coals, and explode violently when rubbed with sulphur or phosphorus; these experiments are not free from danger, and should be tried only with small portions of the substances.

Preparation.—Mix slaked lime, fifty-three ounces, carbonate of potash, twenty ounces, with a little distilled water, so as to make the mixture slightly moist. Place black oxide of manganese, eighty ounces, in a large retort, and having poured on it hydrochloric acid of commerce, Oxxiv., diluted with water, Ovj., apply a gentle sand heat. Conduct the chlorine as it comes over, first through a bottle containing f℥vj. of water, and then into a large carboy containing the mixture of carbonate of potash and slaked lime. When all the chlorine has come off, remove the contents of the carboy, and boil for twenty minutes with distilled water, Ovij. Filter and evaporate till a film forms on the surface, and set aside to cool and crystallize. Purify the crystals by dissolving them in three parts of boiling distilled water, and recrystallize.

When chlorine is passed into a mixture of carbonate of potash and quick lime, the result will be the formation of chlorate of potash, chloride of calcium, and carbonate of lime, $KO, CO_2 + 6\,CaO + 6\,Cl = KO, ClO_5 + 5\,CaCl + CaO, CO_2$. The two former are dissolved out, and easily separated by evaporating, as the chlorate is comparatively insoluble, and the chloride of calcium dissolves to any extent.

Purity.—The absence of chlorides is shown by its yielding no precipitate with nitrate of silver.

Test.—By heat it evolves oxygen, and the resulting chloride of potassium will precipitate nitrate of silver.

Effects.—Some practitioners consider the chlorate of potash of little or no value given internally, and it will often fail where it seems likely to do good; still I have known it prove of great service in gangrenous affections, and especially with children in scarlatina, cynanche, and the milder forms of diphtheria; it may be added to bark mixture; or dissolved in water, and used as the ordinary drink of the patient; during febrile diseases the tongue becomes clean and moist whilst taking this salt, which formerly had a reputation as an oxygenating agent, and was supposed to act as a substitute for mercury in hepatic and syphilitic diseases. In gargles, it is employed to check excessive salivation; and in lotions applied to phagedenic, indolent, and cancerous ulcers; a few drops of some mineral acid is often added to the solution, which sets free chloric acid, an instable compound, that readily decomposes, evolving chlorine.

Dose.—Ten to sixty grains, in solution, every four hours; for children, three to ten grains, according to their age. In gargles, lotions, &c., a quarter of an ounce, dissolved in eight ounces of fluid.

POTASSÆ PERMANGANAS.—**Permanganate of Potash** (KO, Mn_2O_7).—This salt crystallizes in small slender prisms of dark purple colour; inodorous, with a sweet astringent taste; soluble in about sixteen parts of cold water; its colouring power is intense—a single crystal will tinge an ounce of water; if heated with a little rectified spirit, the organic matter reduces it, depositing a brownish sediment.

Preparation.—Powder chlorate of potash, ℥iijss., and mix with black oxide of manganese in fine powder, ℥iv.; put this in a porcelain basin, and add caustic potash, ℥v., dissolved in distilled water, f℥iv. Evaporate to dryness in a sand bath, stirring diligently to prevent spurting; powder the mass; place it in a Hessian or Cornish crucible, and expose to dull red heat for an hour, or until semi-fused. Let it cool; powder, and boil with distilled water, Ojss.; when the insoluble part subsides, decant the fluid. Boil the residue with half a pint more of water, and again decant. Neutralize the united liquids accurately with dilute sulphuric acid, and evaporate till a pellicle forms. Set it aside, and crystallize; drain the crystalline mass. Boil it in f℥vj. of distilled water, and strain through a funnel, the throat of which is slightly obstructed by a little asbestos. Let the fluid cool, and crystallize. Drain the crystals, and dry them in a bell glass over sulphuric acid.

When caustic potash, chlorate of potash, and black oxide of manganese are mixed and heated to dull redness, the water of the potassa escapes, and the green mass consists of chloride of potassium and manganate of potash, $6\,MnO_2 + 6\,KO, HO + KO, ClO_5 = 6\,HO + KCl + 6\,KO, MnO_3$. This should *not* be fused, which renders it nearly insoluble in water. When dissolved, the colour passes from green through blue into red, forming permanganate of potash, $3\,KO, MnO_3 = 2\,KO + KO, Mn_2O_7 + MnO_2$. The insoluble peroxide of manganese precipitates. Sulphuric acid is added to combine with the potash set free, and facilitate the crystallization of the salt, which is best accomplished from a neutral solution.

Purity.—It should be soluble in water; five grains in solution require for complete decoloration a solution of forty-four grains of granulated sulphate of iron, acidulated with dilute sulphuric acid, fʒij.

Test.—Heated to redness, black oxide of manganese results, and potash, which can be dissolved and tested.

Effects.—It has been given internally for diabetes, with some benefit. Its special value is its powerful oxidizing action, hence it destroys odours, and is considered a disinfectant; it is used to fœtid ulcers, to correct vaginal discharges, and in open cancer, &c.; in the sick room a basin of water with a little of this salt in solution absorbs offensive smells, and is particularly useful in puerperal affections, dysentery, gangrenous diseases, and purulent drainings.

The stronger solutions are applied to ulcers, both as escharotics and deodorizers, or sometimes the salt in powder is lightly sprinkled over the surface of the sore. Weak lotions of faint purple tint are of service for gargles, as washes to purify the mouth and teeth, and for immersing the hands after surgical operations or examinations.

Dose.—Three grains, three or four times daily, in sufficient water to dilute it. For washes, one to fifteen grains are dissolved in f℥j. of water.

LIQUOR POTASSÆ PERMANGANATIS.—Solution of Permanganate of Potash.—A convenient formula for lotions and gargles; it should be recently prepared, and is destroyed by all organic matters.

Preparation.—Of the salt, 4 grains; distilled water, f℥j. Dissolve.

FERROCYANIDE OF POTASSIUM.—Yellow Prussiate of Potash ($K_2FeCy_3 + 3HO$).—Occurs in large, lemon-yellow, tabular, translucent crystals; soluble in three or four parts of cold water, and insoluble in alcohol: when heated, it becomes white, losing water, and if ignited is decomposed; its taste is saline and bitterish.

Preparation.—It is obtained by heating blood and refuse animal matters with an equal weight of carbonate of potash, and one-third their weight of iron filings, in a covered iron pot. The pasty mass, when cool, is dissolved in water, and slowly generates the salt. The cyanogen is obtained from the nascent nitrogen and hydrogen of the organic matter, and considered to form an organic radicle, ferrocyanogen, with iron, C_6N_3Fe, as that metal cannot be recognised by the ordinary tests; this unites with the potash. According to the theory of Berzelius, it was formerly written as a double salt, $FeCy + 2KCy$.

Uses.—The double cyanides are comparatively inert; the simple cyanides possess intensely poisonous properties. Ferrocyanide of potassium is used to prepare hydrocyanic acid; and as a delicate test for some metals, with copper forming a chocolate precipitate; with zinc salts, a white; and with persalts of iron, a deposit of Prussian blue. It gives a characteristic reaction with albumen, which it detects by forming a white precipitate in solutions acidulated with acetic acid; of service in urinary examinations. It is also an excellent antidote for soluble copper salts.

SOLUTION OF FERROCYANIDE OF POTASSIUM.—Employed as a reagent.

Preparation.—The salt in crystals, ¼ ounce; distilled water, f℥v. Dissolve.

FERRIDCYANIDE OF POTASSIUM.—Red Prussiate of Potash ($K_3Fe_2Cy_6$).—Is got by passing chlorine through a dilute solution of the ferrocyanide until it ceases to precipitate with persalts of iron; the chlorine acts by withdrawing one-fourth of the potassium, $2(K_2FeCy_3) + Cl = KCl + (K_3Fe_2Cy_6)$. It crystallizes in deep red rhombic prisms, in which the organic radicle ferridcyanogen, Fe_2Cy_6, is united with potassium; if written as a double salt, its composition will be $Fe_2Cy_3 + 3KCy$.

SOLUTION OF FERRIDCYANIDE OF POTASSIUM.—Used for testing iron protosalts, with which it strikes Turnbull's blue.

Preparation.—The salt in crystals, ¼ ounce; distilled water, f℥v. Dissolve.

POTASSÆ CARBONAS.—Carbonate of Potash ($KO, CO_2 + 2HO$).—Formerly known as salt of tartar; is got in small white granular masses, strongly alkaline and caustic; deliquescing in moist air; very soluble in water, but insoluble in spirit; at a red heat it loses about twenty-one per cent. of its weight. In commerce it is obtained from the impure potash left on incinerating brushwood, termed black ash; this is heated in a reverberatory furnace, to consume all impurities of vegetable origin, and when dissolved and evaporated is sold as pearl ash, in which state it yields usually about sixteen per cent. of water.

Impurity.—It always contains traces of silicate of potash; hence, when supersaturated with nitric acid and evaporated to dryness, the residue dissolves, with the exception of a little silica; the presence of sulphates and chlorides in minute quantity can be shown by the faint precipitates caused by chloride of barium and nitrate of silver. Eighty-seven grains require for saturation at least ninety-eight measures of the volumetric solution of oxalic acid.

Effects.—It may be employed like other alkalies; its taste is so unpleasant and caustic, that it is seldom used, unless as a domestic remedy for hooping-cough with cochineal in solution; or added to baths and lotions for cutaneous eruptions, as lichen, prurigo, and chronic impetigo. Large quantities will produce all the effects of a violent corrosive poison. (See liquor potassæ, for the symptoms and treatment.)

Dose.—In lotions, ten to thirty grains suffice for Oj. For baths, ℥j. to ℥iij. are added to twenty gallons of water.

POTASSÆ BICARBONAS.—Bicarbonate of Potash ($KO, HO, 2CO_2$).—Crystallizes in colourless right-rhombic prisms; soluble in four parts of cold water; neutral to test paper; mildly alkaline in taste, and unchanged by exposure to dry air. When rapidly boiled, its solution parts with one-fourth its carbonic acid; fifty grains, heated to low redness, leave thirty-four and a half grains of carbonate of potash, which require for exact saturation fifty measures of the volumetric solution of oxalic acid.

Preparation.—Dissolve carbonate of potash, lb.j., in distilled water, Oij.; filter the solution into a Oiij. bottle, tightly closed by a cork, traversed by a glass tube, sufficiently long to pass to the bottom of the fluid. Place white marble in fragments, lb. j., in another bottle, in the bottom of which a few holes are drilled, and the mouth of which is closed by a cork, also traversed by a glass tube. Connect the two tubes by a caoutchouc tube, having placed the bottle with marble in a jar as high as itself, but wider. Fill this with hydrochloric acid, Ojss., diluted with water, Oiij.; let the carbonic acid pass through the potash bottle for a few minutes, to expel the air, before tightening the cork, and let the process continue for a week, when numerous crystals will have formed. Remove and wash them in a capsule with twice their bulk of cold distilled water, and then dry them on blotting paper in the air. The mother liquid filtered, if necessary, and concentrated to one-half at a heat not above 110°, will yield more crystals.

The tube in the potash solution should be wide, as the crystals forming inside it would check the process.

Like the carbonate of soda process, carbonic acid is evolved, and slowly absorbed by the carbonate of potash in solution, depositing crystals of the less soluble bicarbonate. $KO, CO_2 + CO_2 + HO = KO, HO, 2\,CO_2$.

Impurity.—None likely to occur.

Effects.—A valuable antacid, in gastric acidity, and for correcting acid states of the urine, for which purposes it is best taken an hour or so after meals. It is largely used for effervescing mixtures, twenty grains neutralizing fifteen of citric or tartaric acid, or f℥iijss. of lemon juice. Dr. Garrod has employed it with success in acute rheumatism, giving forty grains in weak solution every two hours, and continuing it for a few days after the swelling of the joints and fever has subsided; this treatment is considered to act by rendering the secretions alkaline, and aiding the escape of morbid matters from the system; it is also thought to diminish the frequency of fibrinous deposits on the valves of the heart, by increasing the alkalinity of the blood. I have found a well-regulated alkaline treatment very successful, but prefer giving the acetate of potash to the bicarbonate; still, cases do occur which improve more rapidly with bark, colchicum, lemon juice, opiates, or other remedies; no disease being more difficult to reduce to arbitrary therapeutic rules, or requiring nicer judgment for its removal; and it is possible that rheumatic swelling and fever accompany many morbid conditions of the blood, which will require to be better understood before its treatment becomes definite.

Dose.—Ten to twenty grains, in solution. When given in effervescence, like most alkaline salts of the vegetable acids, it passes off through the kidneys as a carbonate.

POTASSÆ TARTRAS ACIDA.—Acid Tartrate of Potash ($KO, HO, C_8H_4O_{10}$).—Cream of tartar, or bitartrate of potash, is deposited during the fermentation of wine, being less soluble in the resulting alcoholic fluid than in fresh grape juice. The crude salt, termed argol, is coloured, and requires to be purified by solution in water, filtered through aluminous clay or charcoal, to separate the colouring matter and impurities, and re-crystallized. In commerce it is sold in powder or white crystalline masses, tastes gritty and sour, is insoluble in alcohol, and dissolves in 180 parts of cold or seven of boiling water; strongly heated, it evolves inflammable gases, and leaves a dark residue of carbon and carbonate of potash, used as a reducing agent, termed black flux.

Adulteration.—When sold in powder, it is liable to be adulterated with alum, or sulphate of lime. It usually contains two to five per cent. of tartrate of lime, and occasionally racemic acid, a metameric modification of tartaric acid, in considerable quantity; neither appears to interfere with the medical properties. Racemic acid is tested by dissolving the salt in water, saturating with potash, adding lime water, and boiling, to precipitate tartrate and racemate of lime; the former is redissolved by solution of sal ammoniac, the latter remains insoluble. The presence of tartrate of lime is shown by the residue left after heating cream of tartar to dull redness giving a precipitate with oxalate of ammonia. Lastly, the alkaline residue of 108 grains, after being heated in this manner, requires for saturation 100 measures of the volumetric solution of oxalic acid.

Effects.—Cream of tartar is used for preparing tartaric acid and the tartrates. In moderate doses it acts as an aperient, most energetic when partially dissolved; thus it enters into the sulphur electuary and compound jalap powder. In perfect solution it is employed to augment the action of diaphoretic or diuretic remedies, and occasionally as a domestic cure for febrile colds. One of the favourite modes of using it is in the form of "Imperial," which consists of cream of tartar, ℥ij.; boiling water, Oj.; sweetened, and flavoured with slices of lemon. Cream of Tartar Whey is prepared by coagulating boiling new milk with a solution of the salt in water, and straining off the clear fluid for use. These preparations are taken *ad libitum*, and occasionally medicated by adding small doses of tartar emetic.

Dose.—As a purgative, sixty grains to a quarter ounce; as a diaphoretic or diuretic, twenty to forty grains in solution.

POTASSÆ TARTRAS.—Tartrate of Potash ($2KO, C_8H_4O_{10}$).—Soluble, or purgative tartar, is described as forming small four or six-sided prisms; it is generally sold in granular masses, from rapid evaporation; its taste is saline, and rather bitter; it dissolves in less than its weight of cold water; heated with sulphuric acid, it chars into a dark fluid, evolving inflammable gases, and the odour of burnt sugar.

Preparation.—Carbonate of potash, 9¼ ounces; dissolve in boiling distilled water, Oijss.; add gradually acid tartrate of potash, ℥xx., or sufficient to render the fluid neutral to test paper, after boiling for a few minutes. Filter, evaporate till a pellicle forms, and crystallize; drain, and dry the crystals in warm air. The mother liquid will yield more crystals by evaporating and cooling.

The potash replaces the basic water of acid tartrate of potash, carbonic acid being set free and expelled by boiling, $KO, CO_2 + KO, HO, C_8H_4O_{10} = 2\,KO, C_8H_4O_{10} + CO_2 + HO$. Filtration removes traces of silica derived from the carbonate of potash, which renders the solution turbid.

Purity.—113 grains heated to redness, till gases cease to escape, leaves a residue requiring 100 measures of the volumetric solution of oxalic acid for saturation.

Effects.—A mild saline purgative, usually given with infusion of senna or rhubarb draught; it is said to prevent griping, which is doubtful. All acids are incompatible with this salt; and being likely to pass off partly through the kidneys as a carbonate, it should be avoided in cases where the urine is phosphatic.

Dose.—Sixty grains to ℥ss., given in solution.

POTASSÆ CITRAS.—Citrate of Potash ($3\,KO, C_{12}H_5O_{11}$).—A white granular powder, of saline taste, deliquescent, and very soluble in water. Heated with sulphuric acid, it forms a dark fluid, giving off an inflammable gas, and the odour of acetic acid.

Preparation.—Crystals of citric acid, ℥vj., dissolve in distilled water, Oij.; add carbonate of potash, ℥viij., or to saturation; filter, and evaporate to dryness, constantly stirring after a pellicle forms till the salt granulates; triturate it in a warm mortar, and keep in close vessels.

The citric simply replaces carbonic acid; but, being tribasic, it unites with three atoms of potash.

Test.—Its solution, mixed with solution of chloride of calcium, remains clear till boiled, when a white precipitate separates, readily soluble in acetic acid; this deposit is citrate of lime.

Purity.—102 grains heated to redness leave a residue, requiring for saturation 100 measures of the volumetric solution of oxalic acid.

Effects.—This "Salt of Riverius" is used to prepare extemporaneous neutral mixtures, and will no doubt act as a diaphoretic and refrigerant, but is less agreeable than the extemporaneous draught with lemon juice and bicarbonate of potash, as it is destitute of carbonic acid; nor has it the medical properties that fresh lemon juice possesses. It decomposes in the system, passing off by the urine as a carbonate, and operates indirectly as an alkali in urinary affections, gout, rheumatism, and other disorders associated with morbid acidity.

Dose.—Twenty to sixty grains, in solution. From 60 to 180 grains suffice for an eight-ounce mixture.

POTASSÆ ACETAS.—**Acetate of Potash** ($KO, C_4H_3O_3$).—This deliquescent salt is sold in white foliaceous masses, without odour, having a pungent saline taste and soapy feel; it is freely soluble in spirit and water; when heated, it fuses, and at a higher temperature evolves acetone, leaving a residue of carbonate of potash.

Preparation.—Acetic acid is neutralized gradually with carbonate of potash in a porcelain basin, leaving the solution slightly acid; then evaporated, cautiously fused, and when cool broken into fragments.

Acetic acid replaces carbonic acid; the salt is fused to destroy any colouring matter, and render it less liable to deliquesce.

Tests.—A solution of this salt with sulphuric acid added, disengages acetic acid, recognised by its odour; and with a dilute solution of perchloride of iron strikes a blood-red colour, forming peracetate of iron.

Purity.—It should react neutral to test paper, and if free from metallic impurities give no precipitate with hydrosulphide of ammonium.

Effects.—Doses of a quarter ounce and upwards are purgative, causing frequent watery discharges; useful in dropsies, jaundice, and other affections relieved by hydragogues. On the Continent, repeated doses of five to ten grains are considered alterative, and used for dispersing glandular swellings; here it is chiefly relied on as a diuretic, prescribed with vegetable infusions of broom or digitalis; the salt becomes absorbed, and, passing off through the kidneys in the form of carbonate, can be given to modify excessive acidity of the urine, and proves remarkably beneficial in treating acute rheumatic attacks—a result explained by its eliminating action on the system—for which purpose it was recommended by the late Dr. G. Bird; when it succeeds, the pain ceases within a few days, and the effusion within the joints becomes absorbed; should the patient suffer from restlessness, opiates at night are of service; and where the salt acts inordinately on the skin, I find it better to employ bark or quinine.

Dose.—As a diuretic, five to thirty grains, taken every three or four hours. For rheumatism, ninety grains to ʒss., given in divided doses during the day, in solution.

SOLUTION OF ACETATE OF POTASH.—A test solution for distinguishing tartaric and citric acids, giving a precipitate of acid tartrate of potash with the former.

Preparation.—Of the salt, ℥ss; distilled water, f℥v. Dissolve.

LITHIUM (Li).—The metallic base of the alkali lithia, is the lightest known solid; sp. gr. 0·59; it resembles silver, is harder than potassium, and can be drawn into wire; it fuses at 360°; when thrown into water, it becomes oxided, like sodium. Lithia exists in several minerals, one of which (SPODUMENE) was obtained in quantity some years since at Killiney, near Dublin.

TESTS.—Carbonate of lithia is distinguished from other alkalies by its sparing solubility in water; lithia burns with a bright crimson flame, and is precipitated by phosphate of soda from alkaline solutions.

LITHIÆ CARBONAS.—CARBONATE OF LITHIA (LiO, CO_2).—A white powder; alkaline in taste and reaction; soluble in 100 parts of cold water; more freely dissolved by carbonic acid solution. It is extracted from the lithia minerals, chiefly from TRIPHYLLIN—a phosphate of lithia, magnesia, and iron, by a difficult process.

PURITY.—Ten grains converted into sulphate, and heated to redness, should weigh 14·86 grains; and redissolved in water, gives no precipitate with oxalate of ammonia or lime water.

TEST.—It effervesces with hydrochloric acid, and if then evaporated to dryness, and redissolved, precipitates with phosphate of soda.

EFFECTS.—Dr. Ure proposed it to dissolve uric calculi, and Dr. Garrod for treating acid urinary sediments and cases of chronic gout; he considers it superior to potash and soda in its solvent action upon the chalky deposit, urate of soda, in gouty cartilages, and from his experiments was induced to give it largely internally. It requires to be persevered in for a considerable time.

DOSE.—Two to eight grains, in solution, three or four times daily. An effervescing LITHIA WATER is sold, which is an agreeable mode of using it.

LITHI ÆCITRAS.—CITRATE OF LITHIA ($3LiO, C_{12}H_5O_{11}$).—A deliquescent amorphous powder; soluble in water; heated to redness, it blackens and gives off inflammable gases from the citric acid; the residue yields the reactions of lithia. It can also be got in crystals.

PREPARATION.—Dissolve citric acid crystals, gr. xc., in distilled water, f℥j.; neutralize with carbonate of lithia, gr. l., added in successive portions; evaporate in a steam or water bath until a viscid liquid is obtained, and dry this in an oven at 240°; then rapidly pulverize.

Citric replaces carbonic acid, and, being tribasic, unites with three atoms of lithia.

PURITY.—Twenty grains, burned at low red heat in the air, leave 10·6 grains of residue.

EFFECTS AND DOSE.—Similar to the carbonate, having the advantage of freely dissolving in water.

AMMONIA (NH_3).—This body approximates so closely in chemical and medical relations to the ordinary alkalies, that it is usually classed with them, and was termed "volatile alkali," before its nature was understood. The name ammonia is derived from the Lybian shrine of Jupiter Ammon, where its salts were originally procured by washing soot; it is present in small quantity in the air; is readily formed from decaying nitrogenous substances, and can be generated by the direct union of its elements, nitrogen and hydrogen, when one or both are in a nascent state. In commerce ammonia and its salts are often obtained from gas liquids, though seldom free from impurities when got in this way. A chemically pure product can be made from the sulphate of ammonia and magnesia, which crystallizes from the waters of the Tuscany boracic acid lagoons.

Ammoniacal gas is colourless and pungent; sp. gr. 0·59; it does not support flame, but is feebly combustible, and when moist reacts powerfully alkaline; it dissolves freely in cold water, and can be liquefied with pressure. The gas consists of thrée volumes hydrogen and one of nitrogen, condensed into two volumes; it is procured in making water of ammonia.

Tests.—Free ammonia is recognised by its odour, by the evanescent brown stain it causes on turmeric paper, and by forming dense white fumes of sal ammoniac with a rod dipped in hydrochloric acid. In solutions it gives a yellow precipitate with bichloride of platinum, which if heated leaves spongy platinum.

Theory.—NH_3 is the only compound of nitrogen and hydrogen that has been isolated. In most of the medical salts NH_4 is considered to be present; this Ammonium acts like an alkaline metal. According to Kane, NH_2, Amidogene, is contained in white precipitate; its salts are termed amides.

LIQUOR AMMONIÆ FORTIOR.—Strong Solution of Ammonia.—Is colourless; highly caustic, and alkaline; of intense pungent odour; sp. gr. 0·891, containing 32·5 per cent. of the gas dissolved in water; fʒj. requires for neutralizing 102 measures of the volumetric oxalic acid solution.

Preparation.—Hydrochlorate of ammonia, lb. iij., in coarse powder, mixed with slaked lime, lb. iv., is placed in an iron bottle, which is put in a metal pot surrounded with sand. An iron tube screws tight into the bottle, and is connected by glass tubing with a Woulf's bottle holding Oj. Connect this with a similar Woulf's bottle, and this with a Oiij. matrass containing distilled water, f℥xxij., and the matrass by glass tubing with a bottle holding distilled water, f℥x. The Woulf's bottles and matrass have each safety syphon tubes, with a very short column of mercury. The heat of a fire, gradually raised, is applied to the pot, and continued so long as gas bubbles pass off into the matrass, when it will contain about f℥xliij. of strong solution of ammonia.

Bottle No. 1 has f℥xvi., and No. 2 has f℥x. of a coloured ammoniacal liquor. Place this in a flask, closed by a cork, through which passes a safety tube, and a glass connecting tube dipping into the terminal bottle of the former process; heat the flask until the liquid is reduced to about three-fourths its former bulk. The product in the terminal bottle will now be solution of ammonia; its strength can be made exactly correct by adding distilled water, or some of the strong solution.

Sal ammoniac and lime heated give off ammonia and water, chloride of calcium remaining, $NH_4Cl + CaO = NH_3, HO + CaCl$. The gas is rapidly absorbed by water, the solution decreasing in density in proportion to its strength.

IMPURITIES.—Carbonate of ammonia, if present, is tested by diluting with four parts of distilled water, and adding solution of lime, which becomes turbid; lime is precipitated with oxalate of ammonia; traces of metals are blackened with hydrosulphide of ammonium; and sulphur compounds derived from the use of gas liquid, precipitate with ammonio-sulphate of copper.

EFFECTS.—Used for preparing the acetate; the solution of ammonia; and compound camphor liniment. Ammonia vapour is a powerful stimulant; it is respired to relieve syncope, in hysteria, to ward off threatened epileptic seizures, and as an antidote in poisoning by chlorine; incautiously employed, it will irritate the lungs and throat, and in one instance at least has proved fatal, by inducing pulmonary inflammation. Applied externally, it produces rapid and severe vesication; for this purpose, a few drops of the strong solution are placed on lint, and prevented from evaporating by covering the part with a cupping glass; the pain which it causes is relieved by using vinegar, but I have seen an extensive anthrax follow it. This mode of counter-irritation is sometimes used in suffocative catarrhs, and for local neuralgias. Ammonia is more often added to stimulating embrocations, which are in constant employment for rheumatic and nervous pains, old sprains, and topical inflammations, as tonsillitis. It neutralizes the venom of wasps and other insects, rubbed directly to the part; and is said to counteract the poison of serpents, but success would greatly depend on applying it early; it is directed to be freely given internally at the same time.

Ammonia must be largely diluted for internal use; it is considered a diffusible stimulant, and constantly prescribed in febrile and eruptive affections, when there are symptoms of vital depression and of internal congestions, or when the eruption in the exanthemata has not fully appeared, or has receded from the skin; also for congestive bronchitic attacks, in the bronchitis of the aged, and the intercurrent pulmonary and bronchial complications arising during the course of continued fever. It affords temporary relief in hysteria, but has no influence in promoting permanent recovery.

The strong solution is a dangerous irritant and corrosive poison, burning the throat and stomach, like potash, though more severely; such accidents are rare; in one instance a fatal result has ensued within four minutes, apparently from spasmodic closure of the larynx. Dilute ammonia is used as an antidote in poisoning by the vegetable sedatives, as foxglove or tobacco, after employing the stomach pump; and is of service in the insensibility induced by intoxication, and in accidents from prussic acid and from chloroform.

Antidotes.—Vinegar and the vegetable acids; treating the subsequent inflammation by the usual means.

Dose.—This preparation should be restricted to external uses; the weaker solution, or aromatic spirit, being given internally.

LIQUOR AMMONIÆ.—Solution of Ammonia.—A solution of ten per cent. of ammoniacal gas, of sp. gr. 0·959, in which the water has absorbed 94 volumes of gas, expanding from 100 to 116 measures. fʒj. requires for saturation 30·8 measures of the volumetric solution of oxalic acid.

Preparation.—The stronger solution, Oj.; distilled water, Oij. Mix.

Used.—Chiefly in preparing external remedies.

LINIMENTUM AMMONIÆ.—Ammonia Liniment.—An imperfect ammoniacal soap, termed hartshorn and oil, used for rheumatic pains, sore throat, &c., applied on flannel, or with friction.

Preparation.—Solution of ammonia, f℥j.; olive oil, f℥iij. Mix.

AMMONIÆ CARBONAS.—Carbonate of Ammonia ($2\,NH_4O, 3\,CO_2$).—The sesquicarbonate of ammonia, or smelling salt, forms white translucent cakes, strongly ammoniacal in taste and odour; in the air it parts with the pungent neutral carbonate, and falls into a white odourless powder, the bicarbonate, which has no stimulant properties; $2\,NH_4O, 3\,CO_2 = NH_2CO_2 + NH_4O, HO, 2\,CO_2$. It dissolves in cold water, and is sparingly soluble in weak spirit. 50 grains should require 84·74 measures of the volumetric oxalic acid solution for neutralizing.

Preparation.—The sal ammoniac, or sulphate of ammonia, obtained from gas liquids, is sublimed with chalk in iron retorts. As the resulting salt is impure, it requires to be resublimed for medical purposes.

In this reaction one atom of ammonia escapes. Thus, sal ammoniac and chalk yield chloride of calcium, sesquicarbonate of ammonia, and ammoniacal gas, $3\,NH_4Cl + 3\,CaO, CO_2 = 3\,CaCl + 2\,NH_4O, 3\,CO_2 + NH_3HO$.

Purity.—When effloresced it is unfit for medical use, unless for effervescing mixtures. If got from gas liquids, it may contain tarry products, which are perceived by their odour on saturating with an acid.

Effects.—Being less caustic than solution of ammonia, it is preferred for internal use, though seldom given as an antacid. Bouchardat strongly advised it in diabetes, in full doses, employing wine at the same time, and gluten bread, and recommending abstinence from all foods containing starch. Unfortunately it has not succeeded with us in giving much relief in this intractable disease. Pereira considered it of service in epilepsy, particularly for the syncopal forms, for which he gave large doses, as ten to twenty grains, thrice daily. In moderate quantities it is constantly prescribed as a stimulant in typhoid affections, low forms of erysipelas, &c.; and for congestive bronchitis and pneumonic attacks, combined with preparations of polygala, squill, or mercury; some caution is necessary with it when diarrhœa is present, as it is liable to affect the bowels.

From twenty to thirty grains will operate as a rapid and safe emetic, useful in narcotic poisoning, and the latter stages of suffocative catarrh.

In preparing effervescing mixtures, twenty grains are sufficient to neutralize fʒvj. of lemon juice; it is also used for making the saturated saline mixture, sixty grains of the salt being converted into citrate by lemon juice, and water with sufficient syrup, added to make f℥viij.; this solution is diaphoretic, like citrate of potash; its activity is increased by the addition of tartar emetic or aromatic spirit of ammonia. The dose is f℥ss. to f℥j. every three or four hours.

Dose.—As a stimulant and diaphoretic, three to five grains, in pill or solution; as an emetic, twenty to thirty grains.

SOLUTION OF CARBONATE OF AMMONIA.—Is used to test the soluble salts of zinc and copper.

Preparation.—The salt in fine powder, ℥ss.; distilled water, f℥viij. Dissolve, and add more water to make f℥x.

AMMONIÆ HYDROCHLORAS.—**Hydrochlorate of Ammonia** (NH_4Cl).—Sal ammoniac forms tough semi-transparent odourless masses, of sharp saline taste; it dissolves freely in water, lowering the temperature considerably during its solution; when heated, it sublimes before fusing, much below a red heat; according to the view entertained of its composition, it is written, NH_3, HCl, or NH_4, Cl.

Preparation.—The impure ammoniacal salts got from gas liquors are sublimed with common salt in iron pots lined with clay. If sulphate of ammonia is used, the reaction will be $NH_4O, SO_3 + NaCl = NH_4Cl + NaO, SO_3$.

Tests.—Heated with lime or potash, it evolves ammonia; its solution precipitates with nitrate of silver from the presence of chlorine.

Impurities.—Cakes of this salt are sometimes stained with an iron compound, derived from the vessels they are sublimed in; to detect it nitric acid must be added, and then ferrocyanide of potassium, which strikes Prussian blue.

Effects.—From the intense cold caused during its solution in water, it is used as a refrigerant to recent sprains and injuries, in acute cerebral inflammation, and occasionally to aid in reducing hernia. Solutions of j., or more of the salt in water, Oj., are stimulant, and applied for absorbing contusions and ecchymoses, to tumors on the scalp of recently-born children, and to disperse chilblains. On the Continent it is considered an alterative, and given internally in those affections for which we use small doses of mercury or iodide of potassium, as for dispersing chronic tumors, in scrofulous indurations, and in long-continued diseases of the lungs, liver, or uterus.

Dose.—Five to ten grains, in powder or solution.

SOLUTION OF HYDROCHLORATE OF AMMONIA.—Used in testing for magnesia, by ammonia and phosphate of soda; the resulting precipitate being insoluble in sal ammoniac.

Preparation.—The salt, ℥i.; distilled water, f℥viij. Dissolve, and make up the solution to f℥x. with more distilled water.

AMMONIÆ PHOSPHAS.—**Phosphate of Ammonia** ($3NH_4O, PO_5 + 5 HO$).—Crystallizes in colourless transparent prisms, readily soluble in water, having a saline taste; exposed to air, it loses water and some ammonia, becoming opaque.

Preparation.—Strong solution of ammonia, f℥viij.; dilute phosphoric acid, f℥xx. Mix, and dissolve by gentle heat the crystalline precipitate, and set aside that crystals may form; dry them on filtering paper on a porous brick. The mother liquor evaporated to half, with strong solution of ammonia, f℥ij., added, will give more crystals.

Phosphoric acid, being tribasic, unites with three atoms of ammonia.

Purity.—Twenty grains in water, precipitated by ammonio-sulphate of magnesia, and washed on a filter, with water and solution of ammonia, mixed in equal volumes, dried and heated to redness, weighs 11·44 grains. The precipitate of ammonio-magnesian phosphate ignited, leaves a bibasic phosphate, $2 MgO, PO_5$, from the weight of which the quantity of phosphoric acid present can be calculated.

Tests.—Heated with lime or potash, ammonia escapes; with nitrate of silver, the yellow phosphate of silver is precipitated.

Effects.—An old remedy in chronic gout and rheumatism, lately revived; its solution has the property of holding dissolved a large quantity of urate of soda.

Dose.—Ten to forty grains.

HYDROSULPHURET OF AMMONIA (NH_4S, HS).—A colourless solution, of acrid taste, smelling strongly of sulphuretted hydrogen; it rapidly absorbs oxygen from the air, forming several salts, as NH_4S_2, a deep yellow-coloured bisulphide; then NH_4O,S_2O_2, hyposulphite of ammonia; and lastly, depositing sulphur, it changes into the sulphate, NH_4O, SO_3.

Preparation.—Pass sulphuretted hydrogen into solution of ammonia, f℥j., as long as the gas is absorbed.

Used—As a test solution for metals.

SULPHATE OF AMMONIA (NH_4O, SO_3).—Is obtained by neutralizing carbonate of ammonia with dilute sulphuric acid; its crystals are isomorphous with sulphate of potash; it dissolves in two parts of cold water, and has a sharp unpleasant taste; strongly heated, it decrepitates, melts, and sublimes, partly decomposing. Its only use is to expel traces of nitrous acid from sulphuric acid, the reaction being $NH_4O, SO_3 + NO_3 = 4\,HO + 2\,N + SO_3$.

AMMONIÆ BENZOAS.—**Benzoate of Ammonia** ($NH_4O, C_{14}H_5O_3 + HO$).—Forms colourless laminar crystals, freely soluble in water and spirit; when heated, it sublimes perfectly.

Preparation.—Mix solution of ammonia, f℥iij.; distilled water, f℥viij.; dissolve benzoic acid, ℥ij., in it. Evaporate with gentle heat, and crystallize.

Effects.—Dr. A. Ure recommended benzoic acid for uric sediments, from the rapidity with which it is converted in the system into hippuric acid, by combining with nitrogenized elements; and Dr. G. Bird's observations show that under its use the uric acid becomes decreased to about its normal quantity; the change can be explained by assuming that the elements of glycocol or gelatine sugar disappear, $C_4H_4NO_3$, glycocol, + $C_{14}H_5O_3$ benzoic acid, = $C_{18}H_9NO_6$ hippuric acid. According to Garrod, urea alone diminishes in amount. Dr. Holland introduced the ammonia salt, which has the advantage of being soluble and easily taken; it increases the acidity of the urine, and is useful in chronic affections of the bladder with phosphatic deposits; it has also been given in gouty attacks, and in cases of jaundice, with good effect.

Dose.—Ten to forty grains, three or four times daily, in solution.

LIQUOR AMMONIÆ ACETATIS.—**Solution of Acetate of Ammonia** ($NH_4O, C_4H_3O_3$).—A colourless solution of slight saline taste; sp. gr. 1·06; six times stronger than the former officinal solution, or Mindererus' spirit, and wanting the carbonic acid which it contained. Evaporated, it affords deliquescent oblique rhombic crystals.

Preparation.—Neutralize strong solution of ammonia, ℥iijss., with acetic acid, f℥x., or a sufficiency.

Purity.—It should act neutral with test paper, and diluted with four parts of water gives no precipitate with nitrate of silver or chloride of barium, if free from chlorides and sulphates. f℥j., with excess of hydrochloric acid evaporated in a water-bath, leaves 100 grains of hydrochlorate of ammonia.

Test.—With sulphuric acid it evolves an acetous odour.

Effects.—Diluted with water, it is used as a collyrium in ophthalmia, to which opiates are often added; in lotions, it is applied to contused and inflamed surfaces, and with camphorated spirit over gouty swellings. Internally it is constantly added to febrifuge mixtures as a mild diaphoretic, and forms a pleasant draught with carbonic acid water; as its activity is not great, nitre or tartar emetic are frequently combined with it.

Dose.—fʒj. or fʒij. added to a draught. For an eight-ounce lotion, f℥ss. to f℥j. of the solution will suffice.

OXALATE OF AMMONIA ($NH_4O, C_2O_3 + HO$).—Used to test lime, with which it forms an insoluble oxalate, the ammonia combining with any acid set free. Oxalate of lime is one of the commonest urinary concretions, the mulberry calculus; by heat it is reduced to quick lime, which restores the blue colour to red litmus paper.

Preparation.—Dissolve purified oxalic acid, ℥j., in boiling distilled water, f℥viij. Saturate with carbonate of ammonia; filter, cool, and crystallize.

SOLUTION OF OXALATE OF AMMONIA.—A test solution.

Preparation.—The dry crystals, not effloresced, ℥ss.; warm distilled water, Oj. Dissolve.

CALCIUM (Ca).—The metallic base of the lime salts, is a light yellow metal, very malleable; intermediate in hardness to lead and gold, which melts at a red heat, and then burns with brilliant light; it rapidly decomposes water. Barytes, strontian, magnesia, and lime, are a group of alkaline earths, distinguished from the metals by not precipitating with sulphuretted hydrogen, and from the alkalies by having insoluble carbonates.

Tests.—The salts of lime are separated from other alkaline earths by precipitating with oxalate of ammonia; the resulting oxalate of lime is soluble in nitric acid.

CALX.—**Lime** (CaO).—When pure, quicklime is white, but got from common limestone it has a greyish hue; it tastes acrid and alkaline; is not fusible, becoming incandescent at high temperatures; with two-thirds its weight of water, it slakes rapidly, falling into powder, and swelling to about three times its former bulk. It is obtained by burning marble or limestone in kilns until the carbonic acid is expelled.

Purity.—After slaking, it dissolves without effervescence in dilute hydrochloric acid; the solution evaporated to dryness, and the residue redissolved in water, gives only a scanty precipitate when saccharated solution of lime is added, showing merely a trace of magnesia or alumina.

Used—To make the hydrate.

CALCIS HYDRAS.—Slaked Lime ($\mathrm{CaO, HO}$).—By slaking, lime increases in bulk, and falls into powder; it is used for preparing caustic potash, lime water, &c.

Preparation.—Place recently burned lime, lb. ij., in an iron pot; add distilled water, Oj., and when vapours cease to escape, cover with a lid, and let it cool; pass the powder through an iron wire sieve. It should be freshly made for use.

LIQUOR CALCIS.—Lime Water.—Lime requires for solution 720 parts of cold water, or 1400 of boiling, being more soluble at low temperatures; it is a colourless fluid, of strong styptic taste, which rapidly absorbs carbonic acid if exposed to air, and is best preserved with an excess of slaked lime to replace the carbonate thus formed.

Preparation.—Shake slaked lime, ℥ij., in a stoppered bottle with distilled water, one gallon, for two or three minutes, and after twelve hours pour off the clear liquor for use with a syphon; the sediment will, if the lime is pure, answer for repeating the process three or four times.

Purity.—f℥x. require for neutralizing at least twenty measures of the volumetric solution of oxalic acid.

Effects.—Lime water is antacid and astringent, it is usually given with warm milk, which disguises its taste; it relieves nausea and vomiting depending on irritability of the stomach, gouty dyspepsia, and chronic attacks of diarrhœa; in cancerous affections of the stomach, a diet of lime water and milk is often tolerated, and gives great relief, when other food is rejected; it is also of service in the gastric attacks of children, and during the distressing vomiting of pregnancy. Injections of lime water are used to expel ascarides, and in treating vaginal excoriations, pruritus, and leucorrhœa.

Dose.—f℥ss. to f℥ij., three or four times daily.

LIQUOR CALCIS SACCHARATUS.—Saccharated Solution of Lime.—Lime is dissolved by sugar, forming a bitter compound, CaO, $C_{12}H_{11}O_{11}$, very soluble in cold water; its solution, if boiled, appears to coagulate, and redissolves on cooling; exposed to air, carbonic acid is absorbed; and when two-thirds of the lime are converted into carbonate, the solution will solidify into a jelly. The officinal preparation contains 7·11 grains of lime in each f℥j., and requires for saturation 25·4 measures of the volumetric oxalic acid solution; its sp. gr. is 1·052.

Preparation.—Mix in a mortar slaked lime, ℥j.; refined sugar, in powder, ℥ij.; add this to distilled water, Oj., in a bottle; cork it, and shake occasionally for a few hours; finally, syphon off the clear fluid, and preserve it in a stoppered bottle for use.

Effects.—It is employed in the diarrhœa of children, and for chronic vomiting and the vomiting of pregnancy. M. Trousseau recommends a small quantity to be added daily to the milk used for food with infants who are liable to abdominal attacks.

Dose.—fʒss. to fʒj. for the adult; with children, ten to thirty drops, properly diluted.

LINIMENTUM CALCIS.—**Liniment of Lime.**—Or Carron Oil, so termed for being first used at the Carron Iron Works for scalds and burns, for which it still continues to be a favourite application; oil of turpentine is sometimes added to it with advantage. In arsenical poisoning it aids the expulsion of the poison, by promoting vomiting, and to some extent acts as an antidote, the lime rendering it less soluble.

Preparation.—Lime water and olive oil, of each equal parts. Mix.

CALX CHLORATA. — **Chlorinated Lime** ($CaO, ClO + CaCl$).—Or Bleaching Powder, should be pure white, having a feeble chlorous odour, and acrid bitter taste; it consists of hypochlorite of lime, CaO, ClO, mixed with chloride of calcium, which renders it deliquescent, and a variable proportion of slaked lime. It should dissolve in water, leaving little residue; the solution, though strongly alkaline, has slight bleaching properties, unless an acid is added to set free chlorine; fair commercial specimens afford thirty to thirty-six per cent. of this gas.

Preparation.—When chlorine is slowly passed into quick lime, it forms hypochlorite of lime, and chloride of calcium, $2\,CaO + 2\,Cl = CaO, ClO + CaCl$. If rapidly evolved, chlorate of lime results, $6\,Cl + 6\,CaO = 5\,CaCl + CaO, ClO_5$.

Purity.—Ten grains in distilled water, f℥iv., with iodide of potassium, gr. xxx., acidulated with hydrochloric acid, fʒij., produce a reddish solution requiring at least eighty-five measures of the volumetric solution of hyposulphite of soda to discharge its colour.

Effects.—Hypochlorous acid, slowly escaping from this salt, is used for deodorizing; it is of special service in removing sulphuretted and ammoniacal compounds; when a rapid action is desirable, an acid must be added to the chloride of lime, suspended in water. Its alleged property of destroying contagious animal poison, as scarlatina or small-pox, is doubtful; those animal miasms appear to possess an independent vitality sufficient to maintain their existence for a short time, which excludes them from the list of simple chemical substances, and, so far as we yet know, are best destroyed by heating; thus, the clothes of hospital patients are more certainly disinfected by the warmth of an oven than by any ordinary deodorizer; next to which, free exposure to air appears to succeed best in removing infection.

In solution, it requires to be considerably diluted for medical use; as a lotion it is employed to decompose the irritating products of decay, and for stimulating gangrenous and fœtid ulcers, in open cancer, offensive uterine discharges, &c.; also for dressing compound fractures, amputations, or wounds, when the purulent secretion is unhealthy. During dysenteric attacks or typhoid fever, it is placed in bed vessels to destroy the odour of the evacuations. In gargles it is used to check hypersalivation from mercury; for diphtheric and sloughing sore throat, and for inflammation of the fauces in scarlatina; in washes and tooth powder it is much employed to correct fœtor of the breath, and for whitening the teeth by habitual smokers. Eye-lotions of a weak solution of this salt, or eye-drops composed of twenty grains dissolved in water, f℥j., are recommended for treating purulent ophthalmia in adults and children; it requires to be used frequently, to succeed in such cases when at all severe. Lastly, an ointment of sixty grains, with lard, ℥j., is occasionally prescribed for scabies, and to disperse strumous glandular swellings.

For internal use chlorinated soda is preferred; both are of service in poisoning by sulphuretted hydrogen, ammonia, or prussic acid, as ready sources of chlorine for inhalation.

Dose.—Two to ten grains, in solution.

LIQUOR CALCIS CHLORATÆ. — Solution of Chlorinated Lime.—When exposed to air, this solution smells strongly of hypochlorous acid; its sp. gr. is 1·035; fʒj. dissolved in water, f℥iv., with iodide of potassium, gr. xx., acidulated with hydrochloric acid, give a red solution, requiring forty-six measures of the volumetric hyposulphite of soda solution to discharge its colour.

Preparation.—Mix chlorinated lime, lb. j., distilled water, one gallon, in a mortar; transfer this to a stoppered bottle; shake repeatedly during three hours; filter through calico, and preserve the fluid in a stoppered bottle.

Dose.—For internal use, fifteen to sixty drops, largely diluted; in gargles and lotions, fʒij. to eight ounces of fluid.

CHLORIDE OF CALCIUM.—Is obtained by saturating hydrochloric acid with chalk, adding a little quicklime to precipitate iron or magnesia if present, evaporating to dryness, and fusing at a red heat; it forms white crystalline masses, highly deliquescent, and soluble in water.

Used—To dry gases and liquids, to remove water from ether and chloroform, and to test oxalic acid.

Purity.—It should be dry, and soluble in twice its weight of water.

SOLUTION (SATURATED) OF CHLORIDE OF CALCIUM.—A test liquid, employed to separate nitrous ether from spirit of nitre.

Preparation.—Of the dried and fused salt, 336 grains; distilled water, f℥j. Dissolve.

SOLUTION OF CHLORIDE OF CALCIUM.—Is used for testing citrate of potash.

Preparation.—Of the dried and fused salt, ℥j.; distilled water, ℥viij. Dissolve, and add more water, to make f℥x.

SULPHATE OF LIME ($CaO, SO_3 + 2HO$).—When massive, termed gypsum, and in crystals selenite; heated to 300°, it loses twenty per cent. of water, forming plaster of Paris; this requires about 600 parts of water at 60°, and 450 parts at 212°, for solution.

Used—As a reagent, to distinguish lime, strontian, and barytes; it gives no precipitate with solutions of lime, precipitates barytes immediately, and strontian only after some hours.

SOLUTION OF SULPHATE OF LIME.—Employed to test tartaric acid, which is unaffected by it, if pure.

Preparation.—Rub up plaster of Paris, one quarter ounce, in a porcelain mortar, with distilled water, f℥ij.; place in Oj. bottle; fill with distilled water, and shake frequently; after subsiding, filter, and preserve the clear fluid for use in a stoppered bottle.

PHOSPHATE OF LIME, BONE ASH ($PO_5\,3CaO$).—Got by burning ox or sheep bones to whiteness; it contains a little carbonate of lime.

CALCIS PHOSPHAS PRÆCIPITATA.—**Precipitated Phosphate of Lime.**—An impalpable powder, free from the traces of carbonate of lime found in bone earth; insoluble in water, dissolving without effervescence in dilute nitric acid. On adding acetate of soda, the solution continues clear, but gives with oxalate of ammonia a precipitate of oxalate of lime, and with perchloride of iron a perphosphate of iron, insoluble in the acetic acid which the solution contains, but redissolved by excess of perchloride of iron.

Preparation.—Digest bone ash, ℥iv.; hydrochloric acid, f℥vj.; distilled water, Oj., till dissolved; filter if required; add distilled water, Oj., and then solution of ammonia, f℥xij., or sufficient to cause an alkaline reaction; wash the precipitate on calico with boiling distilled water so long as the washings precipitate with nitrate of silver solution acidulated with nitric acid; dry the product at a heat not exceeding 212°.

Hydrochloric acid converts bone earth into soluble superphosphate of lime, and chloride of calcium, $PO_5, 3\,CaO + 2\,HCl = PO_5, CaO, 2\,HO + 2\,CaCl$. The addition of two parts of ammonia removes the chlorine, forming sal ammoniac, the lime reuniting with the superphosphate, and precipitating, $2\,CaCl + 2\,NH_3, HO = 2\,NH_4Cl + 2\,CaO$, which with $PO_5, CaO, 2\,HO = PO_5, 3\,CaO$.

Purity.—Ten grains should dissolve in hydrochloric acid without effervescing; it gives a precipitate with ammonia, insoluble in boiling solution of potash, which washed and dried still weighs ten grains; there is no loss, the salt being pure.

Effects.—Sometimes given for rickets, tabes mesenterica, and scrofulous affections of the joints in children. It enters into antimonial powder.

Dose.—Ten to sixty grains.

CALCIS CARBONAS.—Carbonate of Lime (CaO, CO_2).—Is obtained in two crystalline states, calc spar and arragonite, and constitutes vast beds of marble, limestone, and chalk rock; it also is found dissolved by carbonic acid in hard waters and many mineral springs. In medicine pure white marble and chalk are employed; the marble, to afford carbonic acid for preparing bicarbonates of soda and potash; the chalk, to make

CRETA PRÆPARATA.—Prepared Chalk.—Chalk is chiefly got from the south-east of England, where it forms strata, evidently of marine origin, as, besides siliceous organic remains of sponges, and shells, that are constantly present, the microscope shows that the dull white masses consist of innumerable minute foraminifera. It is nearly insoluble in water, unless carbonic acid is present.

Preparation.—Chalk, lb. j., is powdered, rubbed with water to a creamy consistence, and, more water being added, the entire is stirred with a circular motion; after standing for fifteen minutes, the milky liquid is decanted into a large vessel; the process is repeated with the residue in the mortar several times, using, if necessary, additional water. The finer sediment that slowly subsides from the decanted liquids is transferred to a filter, and dried at 212°.

By eleutriating, chalk is separated from siliceous impurities and coarse particles.

Purity.—When dissolved in hydrochloric acid, evaporated to dryness, and redissolved in water, it gives a very scanty precipitate with saccharated solution of lime, from the presence of traces of magnesia and alumina.

Effects.—It is dusted over burns, ulcers, and excoriations, as an absorbent, and to exclude the air; in diarrhœa it is constantly employed; its influence must be ascribed to its desiccating and astringent properties—for the secretions are usually alkaline, and it cannot act as an antacid; in those cases catechu, kino, rhatany, aromatics, and above all opiates, are given combined with chalk mixture; its excessive use is said to cause alvine concretions; this is quite possible, but rarely observed in practice. Chalk is a valuable antacid, having no taste, in cases where its astringent effects are not objectionable. It forms the best antidote for oxalic acid and poisoning by the mineral acids, or with chloride of zinc, combining with them to produce inert compounds.

Dose.—Ten to sixty grains, in powder or mixture.

MISTURA CRETÆ.—Chalk Mixture.—Prescribed as an astringent in diarrhœa, frequently combined with opiates and vegetable astringent tinctures.

Dose.—f℥ss. to f℥j. every three or four hours.

Preparation.—Prepared chalk, powdered gum, of each, one quarter ounce; cinnamon water, f℥vijss. Mix, and add syrup, f℥ss.

PULVIS CRETÆ AROMATICUS.—Aromatic Chalk Powder.—Employed as a mild astringent and stimulant in diarrhœa, chiefly for children; it also forms a pleasant extemporaneous chalk mixture.

Dose.—Five to sixty grains, according to age.

Preparation.—Chalk, lb. j.; aromatic powder, lb. iij. Mix, and sieve.

PULVIS CRETÆ AROMATICUS CUM OPIO.—Aromatic Powder of Chalk with Opium.—A valuable astringent in the abdominal affections of children.

Dose.—Two to ten grains; every forty grains being equivalent to one of opium.

Preparation.—Aromatic chalk powder, 9¾ ounces; opium powder, one quarter ounce. Mix, and pass through a fine sieve.

CALCIS CARBONAS PRÆCIPITATA.—Precipitated Carbonate of Lime.—A fine crystalline powder, more minutely subdivided than ordinary chalk, possessing similar medical effects; the subdivision of its particles, its purity, and whiteness, have caused it to be much employed.

Preparation.—Dissolve chloride of calcium, ℥v.; carbonate of soda, ℥xiij.; each in boiling distilled water, Oij. Mix, and let the precipitate subside; wash it on a calico filter until the washings cease to precipitate with nitrate of silver, and dry at 212°.

Chloride of calcium and carbonate of soda form carbonate of lime, and chloride of sodium, which is removed by washing, $CaCl + NaO, CO_2 = CaO, CO_2 + NaCl$.

Purity.—With dilute nitric acid it gives a solution, which, if perfectly neutral, is not precipitated by saccharated solution of lime water added in excess, being perfectly free from alumina and magnesia; nor with nitrate of silver, containing no chlorides.

MAGNESIUM (Mg).—Is a white metal, like silver, malleable and ductile; it is slowly acted on by cold water, dissolves rapidly if a little acid is added; and, heated in the air, burns with dazzling light.

Tests.—Magnesia and its salts do not precipitate with sulphuretted hydrogen, and give a white precipitate from neutral solutions with carbonate of soda; belonging to the class of alkaline earths, it is distinguished from the rest of this class by forming with ammonia and phosphate of soda a granular precipitate of ammonio-phosphate of magnesia, easily soluble in acids; it also has a soluble sulphate, which separates it from lime, barytes, and strontian.

MAGNESIA (MgO).—A white powder, infusible, without taste, nearly insoluble in water, reacting alkaline when moistened, and gradually combining with the water to form a hydrate. Two kinds are officinal:

Magnesia Levis (Light Magnesia).—Obtained by expelling carbonic acid at a low red heat from the light carbonate of magnesia, placed in a Cornish or Hessian crucible, and closely covered with a lid.

Magnesia.—Similarly got, by heating the pharmacopœial "carbonate" of magnesia.

The heat expels carbonic acid, $4MgO, 3CO_2, 4HO = 4MgO + 3CO_2 + 4HO$. When properly made, they do not effervesce with dilute mineral acids.

Purity.—Dissolved in nitric acid, and neutralized by a mixture of ammonia and hydrochlorate of ammonia, they give no precipitates with oxalate of ammonia or chloride of barium, if free from lime salts and traces of sulphate of magnesia.

Effects.—Both have similar medical properties; the heavy form is preferred for use, being three and a-half times denser, and in the same proportion more active. Magnesia is prescribed to correct gastric acidity, and relieve heartburn; from the quantity of acid generated by infants, it is of additional service as a mild, but tolerably certain aperient, combining with the acid to form a laxative salt; for adults we can rarely rely on it, unless during gouty attacks, or given as an effervescing purgative, with citric acid or lemon juice. It is constantly prescribed with the preparations of colchicum in gout, and Pereira found it of advantage in treating gouty headache; it is also given to relieve the sympathetic vomiting of pregnancy; and light calcined magnesia enters into the composition of compound rhubarb powder. Instances are recorded of immense concretions of magnesia collecting in the bowels, one of which weighed lb. v.; these are not likely to occur at present, as it is never employed in such inordinate quantities.

Dose.—For an antacid, ten to thirty grains; as a purgative, twenty to ninety grains; to infants, two to ten grains; being tasteless, it is often given suspended in milk.

MAGNESIÆ CARBONAS. — Carbonate of Magnesia ($3MgO, CO_2, HO + MgO, 2HO$).—This resembles calcined magnesia in properties, but effervesces strongly with dilute acids. Two varieties are used.

Magnesiæ Carbonas Levis.—Light Carbonate of Magnesia.—Occupies about three times the bulk of the heavy carbonate. Under the microscope it consists of fine amorphous powder, mixed with slender prisms; it is largely obtained in commerce from the bittern of sea water, and from magnesian limestone.

Preparation.—Dissolve sulphate of magnesia, ℥x.; carbonate of soda, ℥xij.; each in distilled water, half a gallon; mix the cold solutions, and boil for fifteen minutes in a porcelain dish; collect the precipitate on calico, and wash it so long as the washings precipitate with chloride of barium; lastly, dry at a heat not above 212°.

No change occurs until the solutions are boiled, which expels one atom of carbonic acid, the precipitate consisting of hydrated carbonate, mixed with hydrated oxide of magnesia, $4MgO, SO_3 + 4NaO, CO_2 = CO_2 + 4NaO, SO_3 + (3MgO, CO_2, HO + MgO, 2HO)$.

Magnesiæ Carbonas.—Carbonate of Magnesia.—The ponderous carbonate, examined microscopically, consists of small globular concretions, or pisolitic masses, mixed with finer particles.

Preparation.—Dissolve sulphate of magnesia, ℥x.; carbonate of soda, ℥xii.; each in boiling distilled water, Oj.; mix, and evaporate to dryness in a sand bath; digest the residue for half an hour in distilled water, Oij.; place on a calico filter, and wash until the washings cease to precipitate with chloride of barium; finally, dry at a heat under 212°.

The reaction is similar to the last. During the evaporation the particles adhere by concentric deposits into dense concretions.

Purity.—Dissolved in hydrochloric acid, it should not precipitate with chloride of barium, being free from sulphates; the solution supersaturated with ammonia gives no precipitate with oxalic acid, showing the absence of lime; fifty grains, calcined at a red heat, are reduced to twenty-two.

Effects.—Similar to calcined magnesia in its action as an antacid, and by combining with acids in the stomach becomes cathartic; it is constantly employed in infantile diseases. Magnesia is one of our best antidotes for oxalic acid.

Dose.—Five to thirty grains, for an antacid; twenty to ninety grains, as a laxative.

BICARBONATE OF MAGNESIA.—Freshly prepared carbonate of magnesia, suspended in water, dissolves with carbonic acid under pressure, in the proportion of thirteen to seventeen grains in each fluid ounce. This solution of fluid magnesia was introduced into practice by Sir James Murray; it is a clear fluid, of slightly alkaline taste; exposed to the air, carbonic acid passes off, and hydrated carbonate of magnesia deposits in crystals. Its strength varies; it is easily determined by evaporating, f℥j. to dryness, calcining, and weighing the residue, five grains being equivalent to twelve of common carbonate of magnesia.

Effects.—It acts as a pleasant and effective antacid; and by neutralizing the gastric acidity, or taken in effervescence with lemon juice, will operate as a gentle laxative.

Dose.—f℥ss. to f℥ij.

MAGNESIÆ SULPHAS.—**Sulphate of Magnesia** ($MgO, SO_3, 7HO$).—Epsom salt, so named from being found in springs near Epsom, is sold in small acicular crystals, of bitter taste; it can be got in right-rhombic prisms of large size, which are colourless, transparent, and slightly efflorescing in the air; when heated it melts, losing six atoms of water, and fuses into a white enamel; it dissolves in three parts of cold water, or one and a half of boiling water.

Preparation.—1st. By saturating magnesite, the native carbonate of magnesia, imported from Eubœa, with dilute sulphuric acid.

2nd. An impure sulphate of magnesia is got from the bittern of sea water after crystallizing out its common salt; which is recrystallized to remove traces of chloride of magnesium.

3rd. Magnesian limestone is burned, slaked with water, and much of the lime removed by washing; the residue is acted on with dilute sulphuric acid, and the soluble sulphate of magnesia separated from the insoluble sulphate of lime, and crystallized.

Impurities.—Chloride of magnesium renders it deliquescent; should it effloresce, sulphate of soda may be suspected; when free from lime, it will not precipitate with oxalate of ammonia. Finally, 100 grains thrown down from a boiling solution by carbonate of soda, should, when washed and heated to redness, weigh 16·26 grains.

Effects.—A mild and safe cathartic, causing watery evacuations, like all saline purgatives; and often remaining on the stomach when it is irritable, and rejects less unpleasant remedies; it may be combined with senna, or the acid infusion of roses will disguise its bitter taste. It is best adapted for treating febrile and inflammatory affections; whilst in typhoid fever the purgative salts are peculiarly injurious, increasing the abdominal symptoms, and predisposing to perforation of the intestines. Epsom salt is added to enemas, and is a constituent of many aperient mineral springs; it is an excellent antidote in poisoning with the soluble salts of lead or barytes, forming with them inert and insoluble sulphates; in excessive doses it will produce all the symptoms of a violent and dangerous irritant.

Dose.—Sixty grains to half an ounce, every four hours, until it operates, as a purgative; its effects are increased by dilution. For enemas, ℥ss. to ℥j., or upwards, may be used.

ENEMA MAGNESIÆ SULPHATIS.—**Enema of Sulphate of Magnesia.**—For extemporaneous use, epsom salt is frequently dissolved in infusion of senna, or thin gruel.

Preparation.—Sulphate of magnesia, ℥j.; mucilage of starch, f℥xv.; dissolve, and add olive oil, f℥j. Mix.

SOLUTION OF AMMONIO-SULPHATE OF MAGNESIA ($MgO, SO_3, + NH_4O, SO_3 + 6\,HO$).—Employed to test tribasic phosphates, with which in alkaline solutions it forms a precipitate of ammonio-phosphate of magnesia, or triple phosphate, $2\,MgO, NH_4O, PO_5$; from its weight after ignition the quantity of magnesia present can be calculated, as it contains 35·7 per cent.

Preparation.—Sulphate of magnesia, ℥j.; hydrochlorate of ammonia, ʒss.; distilled water, f℥viij.; dissolve, and add solution of ammonia, f℥ss., and distilled water to make f℥x.

BARIUM (Ba).—A pale yellow metal, malleable and fusible; at a red heat it rapidly decomposes water, and tarnishes in the air from absorbing oxygen; its chief sources are heavy spar, or sulphate of baryta; and witherite, the carbonate of baryta.

Tests.—With sulphuric acid or a sulphate its soluble salts form a white sulphate of baryta, insoluble in dilute acids; burned with alcohol it has a yellowish-green flame, which distinguishes it from strontian, the flame of the latter being red.

CHLORIDE OF BARIUM ($BaCl + 2\,HO$).—Crystallizes in flat four-sided tables, transparent and colourless, of disagreeable bitter taste; it effloresces in dry air, and dissolves in two parts of cold water. It is prepared by reducing sulphate of barytes to a sulphuret by strongly heating with charcoal, then dissolving in water, adding hydrochloric acid, and evaporating the solution to get crystals.

Effects.—In doses of one-twelfth of a grain it is sometimes given for scrofulous diseases, lupus, glandular swellings, and strumous ophthalmia, being considered tonic and alterative. All soluble barytic salts in large quantities are dangerous poisons, causing irritant and narcotic symptoms. Epsom salt is the ordinary antidote forming an inert and insoluble sulphate.

SOLUTION OF CHLORIDE OF BARIUM.—Used to test the soluble sulphates, with which it yields a white precipitate of sulphate of barytes, insoluble in dilute acids.

Preparation.—The salt, ℥j.; distilled water, f℥viii. Dissolve, and add distilled water to make f℥x.

ALUMINUM (Al).—Is a brilliant metal, resembling silver in colour and hardness; it is sonorous, ductile, and a good conductor of electricity; insoluble in cold nitric acid, but rapidly dissolved by muriatic acid, or warm alkaline solutions. Its oxide, alumina, is an essential constituent of alum, and, with the exception of cerium, is the only true earth used in medicine.

Tests.—The oxides of the earths are insoluble in water; they dissolve in the caustic alkalies or their carbonates, and are less basic than the alkalies or alkaline earths. Alumina in solution gives a bulky white precipitate with hydrosulphuret of ammonia, of hydrate of alumina; caustic potash gives a similar precipitate, soluble in excess of potash.

ALUMEN. — **Alum** (Al_2O_3, 3 SO_3 + KO, SO_3 + 24 HO).—The crystals of alum are octohedral; it is sold in transparent colourless masses, odourless, and having a styptic astringent taste; it dissolves in eighteen parts of cold water, the solution reacts strongly acid. In chemistry there are numerous alums, forming an isomorphous group; they all consist of the sulphate of a sesquioxide combined with an alkaline sulphate and twenty-four atoms of water; the salt used in medicine should contain potash and alumina.

Preparation.—Alum shale or slate, a mixture of alumina, bituminous matter, and instable iron pyrites, is roasted, and exposed to the air until the pyrites change into sulphate of iron and sulphuric acid. The alumina combines with the acid; and on adding sulphate of potash, the double salt is produced, and purified by crystallizing. It is cheaper to add waste ammonia liquor from gas works; hence much of the alum of commerce is composed of sulphate of alumina and ammonia, and unfit for medical use.

Purity.—The latter salt is detected by adding a hot solution of soda, in which alum should dissolve without giving off ammonia. It is tested for iron by a mixture of ferro and ferridcyanide of potassium, which ought not to give a blue colour.

Effects.—Alum is styptic, and much used as an astringent. In epistaxis a saturated solution is injected into the nares, or they are plugged with lint dipped in it; for bleeding wounds, leech bites, and hæmorrhoids, it is occasionally of service; and in uterine hæmorrhage is employed either dissolved in cold water with a syringe, or introduced within the vagina on pledgets of sponge or cotton wool; for hæmatemesis it is given internally in solution or powder; and is recommended for checking over-secretion of glairy mucus from the stomach. In conjunctivitis it is used in lotions after the acute stage has subsided, and is of much service in the purulent ophthalmia of infants, for washing out the secretion from the eyes. Alum is constantly added to gargles for relaxed sore throat and relaxation of the uvula. For leucorrhœal discharges and gleet in females, washes of alum, of varying strength, alone, or combined with sulphate of zinc, are prescribed twice or thrice daily, with the best results; an iron alum is also recommended—its effects appear similar to ordinary alum. In lead colic, alum given internally is said to relieve pain and relax the bowels, operating with great certainty, and camphor and opium are advised at the same time, but Tanquerel states that it failed signally with him. Powdered alum is sometimes added to cubebs in treating cases of chronic gonorrhœa.

Dose.—10 to 30 grains; for lead colic, 30 to 100 grains have been given every four hours. In gargles, sixty grains are dissolved in eight ounces of fluid. For lotions and injections, 60 to 120 grains in Oj. of water. To check hæmorrhage, the solution must be concentrated.

ALUMEN EXSICCATUM.—**Dried Alum.**—By drying, alum loses forty-five per cent. of its weight, leaving a white spongy mass; a red heat decomposes it, driving off sulphuric acid.

Used—As an escharotic to fungous ulcerations, to affections of the throat, as in scarlatina, and to the membranous exudations of diphtheria.

Preparation.—Melt alum, ʒiv., in a porcelain capsule; continue the heat so long as watery vapours escape; then powder it.

ARSENIC (As).—Metallic arsenic is a brilliant dark steel-grey crystalline and brittle substance; when heated in closed vessels about 356°, it begins to volatilize without fusing, giving off colourless fumes of garlic odour; in moist air it tarnishes, falling into a grey powder, and if heated ignites, burning with a blue flame, and forming arsenious acid. Its principal ores are compounds of cobalt, nickel, and iron, from which most of the arsenious acid of commerce is derived; it is also got native in small quantity. The metal is obtained by heating arsenious acid with reducing agents, charcoal, or black flux, in a glass tube, and sublimes in the cool portion of the vessel, $AsO_3 + 3\,C = As + 3\,CO$.

Tests.—The oxides of arsenic are distinguished by nitrate of silver, arsenious acid (AsO_3), and its compounds, giving a yellow precipitate; whilst arsenic acid (AsO_5) gives a brick red. In practice, it is usually converted into arsenious acid before testing; thus, arsenic acid with sulphurous acid added affords the following reaction, $AsO_5 + 2\,SO_2 = AsO_3 + 2\,SO_3$.

The reagents are distinguished into liquid and reduction tests.

Liquid Tests.—*Sulphuretted Hydrogen.*—With acidulated solutions of arsenious acid forms a yellow deposit of orpiment; in weak solutions, after passing the gas for some hours, the precipitate is gathered on a filter, dissolved with a few drops of ammonia, and by evaporating on a watch-glass orpiment is again obtained. *Fallacies.*—Cadmium salts give a yellow precipitate, insoluble in ammonia; persalts of tin also give a yellow, and antimonial compounds an orange deposit; if collected and reduced, none of these afford a metallic sublimate.

Ammonio-Nitrate of Silver.—Hume's Test.—Prepared by adding ammonia to solution of nitrate of silver until the precipitate obtained is nearly redissolved. With neutral solutions of arsenious acid it forms a yellow arsenite of silver. As tribasic phosphates also give a yellow deposit with nitrate of silver, it is better to reduce the arsenite and obtain the metal.

Ammonio-Sulphate of Copper.—Scheele's Test.—Prepared like the last, with solution of sulphate of copper and ammonia; it gives a green precipitate in neutral solutions of arsenious acid. As several copper salts are green, it should be further examined by reduction.

When the fluid tests concur in affording the reactions of arsenious acid, there can be no doubt of its presence; still in all medico-legal inquiries it is better to obtain the metal, which is the most conclusive evidence, and can be preserved for future testimony.

Reduction Tests.—Arsenical compounds heated in a small glass tube with any reducing agent, as charcoal or well-dried yellow prussiate of potash, recommended by Professor Davy, will give a brilliant steel-grey sublimate of arsenic; a tube one-eighth of an inch wide is sufficient, and a distinct sublimate can be procured from $\frac{1}{100}$th part of a grain of arsenious acid. By filing off the end of the tube, and gently heating the metallic crust, it disappears, and a ring of crystals of arsenious acid, in modified octohedrons, forms higher up, whilst a garlic odour becomes evident.

A crust of charcoal may be mistaken for arsenic, but is dull-looking, brown, and not volatilized by heat; a sublimate of mercury is at once distinguished by the microscope, consisting of minute globules, that readily cohere.

Marsh's Test.—Depends on nascent hydrogen combining with arsenic to form arseniuretted hydrogen, which is subsequently tested. The apparatus may consist of a strong bottle, closed by a cork with two apertures, one for a funnel passing nearly to the bottom of the bottle, the other for a glass tube, bent at right angles, to permit the escape of the gas. The suspected solution is placed in the bottle with some pure granulated zinc; and dilute sulphuric acid, also pure, is gradually added through the funnel; the gas, as it escapes, is passed into solution of nitrate of silver, and the arsenite of silver that precipitates reserved for further analysis; or it is burned as it issues from the tube, so soon as all atmospheric air is expelled (a mixture of hydrogen and air being explosive); if it contains arsenic, it burns with a blue flame, and deposits arsenious acid on a plate of porcelain held above the flame, and metallic arsenic when the plate is depressed within the flame.

The fallacies of this test are, that zinc or sulphuric acid* may contain arsenic; they should be examined before being used. Antimony unites with hydrogen, forming antimoniuretted hydrogen, which, when burned, will deposit metallic antimony on porcelain; its stain is duller coloured than arsenic, not volatilized by a gentle heat, and insoluble in solution of chlorinated lime; all of which distinguish it from arsenic.

Reinsch's Test.—When arsenical solutions are acidulated with one-fourth of muriatic acid, and boiled with bright slips of copper, metallic arsenic is deposited on the copper as a steel-grey coating; the solution containing subchloride of copper, $AsO_3 + 3HCl + 6Cu = As + 3HO + 3Cu_2Cl$. The copper slips, collected and dried, are heated in a glass tube, and the arsenic in greater part sublimes, and can be dissolved and tested.

This reaction is very delicate, and may be made applicable to organic solutions with little preparation. The fallacies connected with it are, that the muriatic acid or the copper may contain arsenic, and require to be tested before being employed. Antimony, silver, bismuth, and some other metals, will also throw down deposits on copper; they are at once distinguished by not yielding an arsenical sublimate when heated; or by dissolving and applying the liquid tests.

In analyzing organic liquids and solids, the material previously dried with care, and in small pieces, should be slowly distilled with pure muriatic acid; the resulting fluid, if coloured, is to be redistilled; it contains all the arsenic as a chloride, and when diluted with water is fit for examination.

ACIDUM ARSENIOSUM.—ARSENIOUS ACID (AsO_3).—White arsenic of commerce is obtained by roasting arsenical ores of iron, nickel, and cobalt, in a reverberatory furnace; the sulphur present passes off as sulphurous acid; the arsenic oxidizing is volatilized into large chambers, or flues, where it deposits in cooling; it is collected at intervals, and requires to be resublimed to purify it. If heated under pressure, it forms a heavy translucent mass, soon becoming opaque enamel white, and sometimes easily reduced to powder; these two varieties differ in density, the transparent being 3·8, and the opaque 3·6; they also vary in solubility:—

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* Each f℥j. of the ordinary vitriol of commerce contains at present from ten to twenty grains of arsenious acid.

100 parts of water at	60°	dissolving 0·96	of vitreous, and	1·25	of opaque acid;
,,	212°	,, 9· 7	,,	11·47	,,

whilst water boiled with arsenious acid will hold in solution twelve grains to the ounce. Arsenious acid is almost tasteless; it has no odour in the solid state or in vapour; heated to 300°, it sublimes in octohedral crystals, variously modified; and Wohler states that it also will form right-rhombic crystals, being dimorphous.

Adulterations.—It may contain chalk and plaster of Paris, and requires to be purified for medical purposes. When sold in small quantities, it must, according to legal enactment, be mixed with soot or Prussian blue, with the intention of preventing accidents. Four grains, dissolved in boiling water, with eight grains of bicarbonate of soda, discharge the colour of 80·8 measures of the volumetric iodine solution.

Purification.—Place 100 grains of the acid in a thin circular-shaped porcelain capsule; cover this as accurately as possible with a glass flask filled with cold water; apply the heat of a gas lamp. Arsenious acid sublimes, and will be found adhering to the bottom of the flask. Should a larger quantity be required, the commercial acid is sublimed by the heat of a gas lamp, or burning charcoal from a small Florence flask, the neck of which passes into a second flask of larger size, and the lower flask should be protected by a hood of sheet iron from the cooling influence of the air. These sublimings should be conducted near a flue with good draught, to carry off any fumes that may arise.

The impurities are left when the volatile arsenious acid sublimes.

Effects.—Serious accidents are liable to occur with this substance from its deadly properties and freedom from taste; and it was too often used for secret poisoning, until its sale became restricted by legal enactment; the symptoms it causes vary in different persons, in part at least depending on the quantity taken, and may be referred to three classes:—*Gastro-enteric.*—Soon after the poison has been swallowed, in general from half an hour to an hour, faintness, nausea, and sickness occur, with intense burning pain in the stomach, extending over the abdomen; repeated distressing vomiting, cramps, and diarrhœa, rapidly set in; there is incessant thirst and heat in the throat complained of, and sometimes strangury and tenesmus; grave symptoms of constitutional disturbance next manifest themselves, such as irregular rapid pulse, palpitation of the heart, laborious and painful respiration, cold clammy sweats, and often, towards the end of life, convulsions, delirium, and coma; in this form of poisoning death usually ensues in one to three days; it has happened within three hours, but this is exceptional. Such is the ordinary course of acute arsenical poisoning, when half an ounce or so, of arsenious acid has been administered.

Acute Poisoning with Nervous Symptoms.—In those cases the dose of the poison is unusually great, or it has been swallowed in small lumps; vomiting, pains, and purging are absent, or little complained of; there is faintness, perhaps syncope, prostration of strength, convulsions or partial paralysis, delirium or stupor and insensibility, death occurring with rapidity, often in a few hours.

Mixed Cases.—Commencing with the usual gastro-enteric symptoms, after which nervous affections appear, varying in severity from attacks resembling hysteria to epileptiform fits and deep coma; or an imperfect palsy, somewhat like the effects of lead poisoning, may continue for a considerable time; this form occurs where a small quantity of arsenic is taken, or when the patient has recovered after free vomiting from the primary effects of the poison.

A fatal dose may destroy life within less than two hours; this is considered unusually rapid, from eighteen to twenty-four hours being the average period, though it is not rare for the patient to survive for ten or twelve days, or longer. It is difficult to determine the minimum poisonous dose; two or three grains will kill, and serious consequences are known to have resulted from less. There are no *post-mortem* appearances absolutely necessary, as arsenic will in some cases act simply on the nervous system; in general, the stomach and intestines are found intensely congested, and small ulcerations will be formed where minute particles of solid arsenic lodge between the rugæ of the stomach; perforation seldom occurs, and gangrene is not often observed; though the extravasations of black blood effused in the mucous tissue have more than once been mistaken for it. Arsenic becomes absorbed from open ulcers, or mucous surfaces as the rectum and vagina, and causes all the symptoms of poisoning if applied extensively in this manner, and after death the viscera present similar pathological appearances to those that result from its internal use.

In cases which prove rapidly fatal, putrefaction is not retarded. When a quantity of arsenic is contained in the stomach or intestinal canal, they resist decomposition, and the morbid appearances remain visible for a long time; also, if the tissues are saturated with arsenic, as in certain instances of slow poisoning, they become preserved, and the poison being metallic and indestructible, it is recognisable by tests after months have elapsed.

When small repeated quantities of arsenious acid are administered with criminal intent, they gradually undermine the health, inducing a general failure of the vital powers, loss of strength, and wasting; the symptoms resemble chronic dysentery, for which they are liable to be mistaken; or the limbs become paralysed, the hair and nails fall off, and the sufferer dies from exhaustion; in such cases, should suspicion be excited, the urine will possibly afford traces of the poison, as it passes off through the kidneys.

Medical doses given with any care are seldom followed by serious symptoms; the tongue will become coated with soft white fur; and after a time, or in susceptible individuals, there may be redness of the conjunctiva, itching of the eyes, pain in the stomach, or purging; when these evidences of constitutional intolerance are observed, it should be discontinued; and it is always safer to relinquish its use after five or six weeks for a few days, resuming it if necessary, rather than risk its accumulated effects within the system, though there is a greater tolerance of it than is often supposed.* There are some, on the contrary, who, owing to idiosyncracy, will bear this mineral only in minute doses, as one drop of Fowler's solution or less, and require to have it well guarded with opiates.

Arsenical preparations appear to me to act as decided alteratives rather than tonics; and though the appetite will improve under their use, their effects are very different from the vegetable bitters; they are constantly employed in treating chronic eruptions, particularly squamous affections, and seldom disappoint our expectations if properly given, which should only be after all inflammatory symptoms are subdued. I have prescribed them in obstinate cases of anthrax, and for onychia, with the best results; and Pereira considered no remedy was of equal power in arresting the convulsive movements of chorea, in which he stated that it often acted like a specific; painful neuralgic attacks also will yield to the steady use of this powerful agent, which appears to be of service in proportion as the intermittent character of the pain is more decided.

Arsenic in various forms is used as an antiperiodic, in which property it almost ranks with quinine; its cheapness and want of taste cause it to be largely given in America, and Fowler's tasteless ague drop is well known in the fenny districts of England; it is better to employ it during the intervals of the febrile paroxysms, and it has succeeded in removing relapses when large doses of quinine were unsuccessful; a combination of the two remedies is constantly administered, and some think there is less danger of the disease recurring after being arrested by arsenic than from the use of bark or quinine.

Locally, arsenious acid is applied as a caustic to lupoid ulcerations, hospital gangrene, malignant onychia, and those ulcers of the face termed epithelial cancer, to destroy the diseased surface, and permit granulations to spring from the deeper and healthier parts; it is also employed in open cancer, but has no influence whatever in curing this disease; it should never be applied over more than about a square inch of surface at a time, nor repeated too frequently, being liable to become absorbed and induce dangerous symptoms. DUPUYTREN'S POWDER, consisting of one to ten grains of arsenious acid, with 100 of calomel, is a good formula for external use; it is made into a paste with mucilage, or dusted over the ulcerated part;

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* A gentleman recently informed me that he had taken arsenic with short intervals for fifteen years, and at one time so much as ninety drops of Fowler's solution daily!

though it often causes severe pain, yet with moderate caution it is a safe and effectual remedy.

Antidotes.—The stomach should be promptly emptied by the stomach pump, a mustard or sulphate of zinc emetic, or, better still, by copious draughts of melted butter or Carron oil. Any arsenic remaining is neutralized by giving tablespoon doses of hydrated peroxide of iron every few minutes; it acts best when recently made; the reaction that ensues is the formation of an inert compound of protoxide of iron and arsenic acid, $AsO_3 + 2\ Fe_2O_3 = AsO_5,\ 4\ FeO$. When this cannot be got, magnesia is used. The subsequent inflammatory symptoms require the usual treatment, making allowance for the depressing effects of the poison. Lastly, with a view of eliminating it from the system, diuretics are prescribed, and repeated doses of iodide of potassium.

Dose.—For internal use one-twentieth to one-tenth of a grain, best given in solution, and with or after meals.

LIQUOR ARSENICALIS.—Arsenical Solution.—The arsenite of potash, or Fowler's solution, is a favourite mode of using this remedy, being of definite strength and easily administered; each fʒj. contains gr.ss. of arsenious acid.

Dose.—Three to five drops, thrice daily, taken with or after meals; some increase it until ten to fifteen drops are given, but the advantages attained do not compensate for the risk incurred. Gastric irritation, diarrhœa, febrile symptoms, or conjunctival tenderness, contraindicate its use; and after three or four weeks, it is better to suspend it for a few days, and recommence again if necessary.

Preparation.—Arsenious acid, carbonate of potash, of each, gr. lxxx.; distilled water, f℥x.; heat in a flask till dissolved; when cool, add compound tincture of lavender, fʒv., and as much distilled water as will make the bulk Oj.

The boiling is necessary to expel the carbonic acid. As the solution is alkaline, it gives no precipitate with sulphuretted hydrogen, unless an acid is added in excess.

Test.—fʒj., boiled with bicarbonate of soda, gr. x.; distilled water, f℥vj.; and a little starch added, does not give a permanent blue colour with the volumetric iodine solution until eighty-one measures are added.

ARSENIC ACID (AsO_5).—A white anhydrous deliquescent mass, not volatile, changed by a red heat into arsenious acid and oxygen. It is got by treating arsenious acid with excess of nitric acid, and evaporating to dryness; dissolved in water, it forms a highly poisonous solution, from which crystals can be obtained with one, two, or three atoms of HO. Though not officinal, its salts, the arseniates of soda and of iron, are employed.

TESTS.—With nitrate of silver it gives a brick-red precipitate, and by reduction metallic arsenic is sublimed.

ANTIMONY (Sb).—This metal is brilliant bluish-white, brittle, and crystalline, belonging to the rhombohedral system; it fuses at 840°, and when strongly heated in the air burns with a white flame, producing clouds of oxide of antimony. It is obtained by throwing into a red hot crucible portions of a mixture of sulphide of antimony, four parts; acid tartrate of potash, three parts; and nitre, one and a half part; the metal is reduced, and collects beneath a slag of sulphate of potash.

TESTS.—An orange sulphide is thrown down from acid solutions by sulphuretted hydrogen, soluble in hydrosulphuret of ammonia. If antimony dissolved in hydrochloric acid is added to water, it forms a white oxychloride of antimony, that redissolves with cream of tartar.

For medico-legal purposes, the suspected solution is acidulated with muriatic acid, and boiled with bright slips of copper, which become coated with a violet-coloured deposit of the metal; this is dissolved off by solution of potash, exposing the copper slips at intervals freely to the air; and by acidulating with muriatic acid, and adding sulphuretted hydrogen, the orange-coloured sulphide of antimony falls.

ANTIMONII SULPHURETUM.—SULPHURET OF ANTIMONY (SbS_3).—The principal ore of the metal, is obtained from Borneo in large quantities, and prepared for commerce by fusing it off the rocky gangue in which it is found, and casting into round moulds; it is steel-grey, crystalline and brittle, forming a black powder, which has a reddish tinge if the sulphuret is pure; it crystallizes in four-sided prisms, and is less fusible than metallic antimony.

IMPURITIES.—It may contain sulphides of lead, iron, copper, or arsenic; the latter is insoluble in hydrochloric acid; the other metals can be tested in the solution after precipitating the oxychloride of antimony by a quantity of water. Digestion in solution of ammonia for forty-eight hours will remove the arsenic (Gmelin).

USES.—To prepare the antimonials, and to make sulphuretted hydrogen.

ANTIMONII SULPHURATUM.—SULPHURATED ANTIMONY.—This orange-red powder consists of tersulphuret, SbS_3, with a variable and small amount of teroxide of antimony, SbO_3; it has no odour, is almost tasteless, and dissolves readily in caustic soda solution; with hydrochloric acid it evolves sulphuretted hydrogen, depositing a little sulphur; if strongly heated in the air, it burns with a blue flame, forming sulphurous acid, the oxided metal being left.

Preparation.—Boil prepared sulphuret of antimony, ℥x., with solution of soda, Oivss., for two hours, with frequent stirring, occasionally adding distilled water to maintain the same volume; strain the liquid through calico, and before it cools add by degrees dilute sulphuric acid until it is in slight excess; collect the precipitate on a calico filter; wash with distilled water until the washings cease to precipitate with chloride of barium, and dry at a temperature not above 212°.

Caustic soda and sulphuret of antimony boiled in water form two soluble double salts, $2\,SbS_3 + 4\,NaO = 3\,NaS, SbS_3 + SbO_3, NaO$. If allowed to cool, Kermes' mineral is obtained, a mixture of SbS_3 and SbO_3, formerly much used in medicine. By adding sulphuric acid to the hot solution, the sulphuret of sodium is decomposed into sulphate of soda, and sulphuretted hydrogen, which reacts on the oxide of antimony, converting it into golden sulphuret. As a little of the gas escapes, some teroxide is invariably present, which can be dissolved out by boiling with cream of tartar.

Purity.—Sixty grains, dissolved in hydrochloric acid, and dropped into water, give a white precipitate, which, when washed and dried, weighs about fifty-three grains.

Effects.—Its action is rather uncertain, and appears to depend on the quantity of teroxide it contains; large doses will cause vomiting and purging; it is given in febrile and bronchitic affections as a diaphoretic and nauseating remedy, and as an alterative in chronic rheumatism, cutaneous eruptions, and secondary syphilitic symptoms, usually with guaiacum and mercurials, as Plummer's pill.

Dose.—One to four grains are alterative and diaphoretic; ten to twenty grains will act as an emetic.

LIQUOR ANTIMONII TERCHLORIDI.— Solution of Terchloride of Antimony. ($SbCl_3$).—Pure terchloride of antimony is a deliquescent, volatile, and fusible solid, resembling ice in appearance; it is usually sold in solution with excess of hydrochloric acid, and coloured by some persalt of iron from light amber tint to deep red; its sp. gr. is required to be 1·47. Added to water, it decomposes, precipitating white oxychloride of antimony.

Preparation.—Pour hydrochloric acid, Oiv., on prepared sulphuret of antimony, lb. j., in a porcelain vessel, and, stirring constantly, apply gentle heat, which must be gradually augmented as the escape of gas begins to slacken until the liquid boils; after boiling for fifteen minutes, remove the vessel from the fire, and filter through calico, returning what passes first until a clear solution is obtained; boil down to Oij., and keep in a stoppered bottle. The process must be carried on under a flue, for the gas to escape.

Sulphuret of antimony and hydrochloric acid yield sulphuretted hydrogen and terchloride of antimony, $SbS_3 + 3\,HCl = 3\,HS + Sb\,Cl_3$. Its strength is determined by f℥j., mixed with tartaric acid, one quarter ounce; distilled water, f℥iv., forming a clear solution, in which sulphuretted hydrogen gives an orange precipitate, weighing, when washed and dried at 212°, at least gr. xxij.

Effects.—A powerful caustic, abstracting water from the tissues, and becoming itself decomposed; the oxide of antimony colours the parts white, and the hydrochloric acid set free materially increases its action; it is applied to phagedenic and sloughing ulcers, to cancrum oris, and to the bites of rabid animals; in staphyloma it is sometimes brushed over the protruding surface with a hair pencil, and its over-action prevented by washing freely with milk and water. Farriers constantly employ it, under the term butter of antimony; if swallowed, it causes all the symptoms of a dangerous corrosive poison—excruciating pain, vomiting, prostration of strength, and death within a few hours.

Antidote.—If possible, magnesia, chalk, or soda, should be given to decompose it; water or bland diluents are useful.

ANTIMONII OXIDUM.—Oxide of Antimony (SbO_3).—Is a white, tasteless powder, insoluble in water, readily dissolved by hydrochloric acid or the acid tartrate of potash; it fuses at a low red heat, becoming yellow, and rapidly absorbing oxygen, will take fire, forming antimonious acid, SbO_4.

Preparation.—Pour solution of terchloride of antimony, f℥xvj., into water, two gallons; mix thoroughly, and let the precipitate subside; draw off the fluid with a syphon; add distilled water, one gallon; agitate well; again withdraw the fluid, and repeat this affusion and subsidence until the fluid has only a feeble reaction on litmus paper; to the precipitate add carbonate of soda, ℥v., previously dissolved in distilled water, Oij.; leave them in contact for half an hour, stirring frequently; collect the precipitate on a calico filter, and wash with boiling distilled water till the washings cease to precipitate with nitrate of silver acidulated with nitric acid; lastly, dry at a heat not above 212°.

The precipitate first formed is the old powder of Algarotti, a mixture of oxide and chloride of antimony, $9\,SbO_3 + 2\,SbCl_3$. The latter is decomposed by the carbonate of soda, and pure teroxide of antimony obtained by washing.

Purity.—Fused in a test tube, it yields no sublimate, if free from chloride; and is entirely soluble, boiled with excess of acid tartrate of potash.

Uses.—To prepare tartar emetic, and antimonial powder.

PULVIS ANTIMONIALIS.—Antimonial Powder.—Is designed to replace the celebrated Dr. James's fever powder by a cheap substitute of definite composition. This powder is probably prepared by strongly heating sulphuret of antimony and bone earth; it has been repeatedly analysed, and yields about half its weight of phosphate of lime, 32 to 44 per cent. of inert antimonious acid, SbO_4, 0·6, to 1·8 per cent. of teroxide of antimony, and in one instance so much as 8·9 per cent., to which its activity is ascribed, with a small quantity of salts soluble in water, seldom exceeding two per cent., consisting of antimoniate of lime, sulphate of lime, and alkalies. The officinal powder is free from grittiness, without taste or smell, and has one-third of its weight of teroxide of antimony, which should render it a much more useful and energetic preparation, if, as supposed, it constitutes the active agent in the compound.

Preparation.—Mix thoroughly oxide of antimony, ℥j.; precipitated phosphate of lime, ℥ij.

Purity.—The quantity of oxide of antimony it contains is determined by dissolving it out in boiling water with acid tartrate of potash, the residue being phosphate of lime.

Effects.—Phosphate of lime is probably inert, and of little advantage; the oxide of antimony becomes slowly dissolved in the acids of the stomach, and according to the dose can be employed as an alterative, diaphoretic, or emetic; whilst taking it, acidulated drinks are to be avoided, as they enhance its action unpleasantly. It is added to mercurials in treating cerebral inflammations, and constantly given in rheumatic affections and febrile diseases, to act on the skin; in chronic cutaneous diseases it is sometimes of service as an alterative. Dr. Cheyne advised it for threatened apoplectic attacks, in gradually increasing doses, beginning with two grains, and adding gr. ss. every night until gr. xviij. were taken, unless vomiting or purging occurred, when the dose was diminished until it became tolerated.

Dose.—Two to eight grains, repeated every three or four hours, if necessary, in pill, bolus, or powder, as a diaphoretic; one to two grains for an alterative, taken thrice daily.

ANTIMONIUM TARTARATUM.—Tartrated Antimony (SbO_3, KO, $C_8H_4O_{10} + 2HO$).—The tartrate of antimony and potash, or tartar emetic, crystallizes in transparent rhombic octohedrons, which effloresce in the air, becoming opaque white; it has no odour, tastes sweetish, and afterwards styptic and metallic, and is soluble in fourteen parts of cold, or two of boiling water; its aqueous solution, if long kept, is liable to decompose, a soft mass of fine vegetable fibres forming in it, termed by Kutzing, Sirocrocis stibica. All solutions of tartrates occasionally present similar growths. If heated, it decrepitates and blackens, giving off the odour of burnt sugar; dissolved in water, and acidulated with hydrochloric acid, the acid tartrate of potash precipitates, redissolved on adding tartaric acid.

Preparation.—Oxide of antimony, ℥v.; acid tartrate of potash, in fine powder, ℥vj.; mix with distilled water to form a paste, and set aside for twenty-four hours; then add the rest of Oij. of distilled water; boil for fifteen minutes, stirring frequently; filter, and set aside to crystallize.

The mother liquid afterwards evaporated to one-third will give more crystals; dry them on filtering paper in the air.

In this process teroxide of antimony replaces the basic water of the acid tartrate of potash, forming a double salt, the tartrate of antimony and potash, $KO, HO, C_8H_4O_{10} + SbO_3 = KO, SbO_3, C_8H_4O_{10} + HO$.

Purity.—The presence of cream of tartar, sulphate of lime, or other fraudulent adulteration, is shown by the following test:—twenty grains should dissolve perfectly in distilled water, f℥j.; from this sulphuretted hydrogen throws down orange sulphuret of antimony, which, washed and dried at 212°, should weigh 9·91 grains. Traces of arsenic are occasionally present: this dangerous contamination is shown by a modification of Marsh's apparatus, heating the gas as it passes through a long tube placed horizontally, the antimony deposits at the heated point, and metallic arsenic condenses farther off. (See Arsenic.)

Effects.—Large doses have not invariably proved fatal, which may be explained by their being speedily vomited, at least, in many instances; still cases are recorded in which life was lost in a few days after taking forty grains of tartar emetic; it causes nausea and vomiting, burning pain in the abdomen, colic, frequent purging, cramps, convulsions, and prostration; and in two instances, at least, children have died within fourteen days, from the effects of ten grains. Repeated small doses induce symptoms resembling chronic dysentery, or slow arsenical poisoning; if the patient survive, the antimony can be detected in the urine, as it is eliminated through the kidneys; after death, the metal is found in all the tissues, and is most abundant in the liver; the pathological appearances are intense vascularity of the intestines, particularly the stomach and rectum, and engorgement of the lungs is not uncommon.

One or two grains act as an emetic; this is usually given in solution, alone or combined with ipecacuanha; it has been tried in enema, and even injected into the veins; but the latter mode of exhibition, independent of its danger, cannot be relied on. The nausea, depression, and exhaustion induced, are extreme, followed by free vomiting within twenty minutes or so, particularly if aided by draughts of warm water; it is prescribed in the early stages of inflammations, as croup, laryngitis, tonsillitis, orchitis, and incipient bubo, to arrest the diseased action by the powerful and sudden impression caused on the system.

In the commencement of croup, tartar emetic is best employed in small repeated quantities, of one-fourth to one-eighth of a grain every ten or fifteen minutes, to secure the full advantages of its depressing action; and after discharging the stomach, nausea is kept up if necessary, by continuing it at longer intervals; it is well to administer it at first whilst the patient is in a hot bath, which increases its effect. When exudation takes place, it is given every half hour or so, alternately with mercurials, to retard the progress of the disease, and favour the absorption of the mercury, on which we must mainly rely for recovery; in the later stages, when depressing agents are inadmissible, a simple emetic, as ipecacuanha, may be given to unload the bronchial tubes. Tartar emetic has no power in arresting continued fevers or exanthematous diseases, and is liable to cause positive injury by lowering the patient's strength; it is occasionally of service in inflammatory fevers with gastric derangement; and previous to using antiperiodics, for ague and malarious affections.

For jaundice not depending on mechanical causes, as tumors or gallstones, emetics are prescribed an hour or two after a full meal, and repeated every second or third day; they act by unloading the obstructed gall ducts, and stimulate the liver to resume its secreting functions. In cases of irritant or narcotic poisoning, less depressing emetics, as sulphate of zinc, are preferred to antimonials.

Nauseating doses range from one-tenth to one-fourth of a grain; to prevent vomiting, they are often combined with opiates. Dr. Collins pointed out their value in relaxing the rigid uterus during labour, for which purpose they are given at short intervals of fifteen to thirty minutes, and are best suited for cases where the cervix is thin and tense. I find tartar emetic of much service in relieving spasmodic asthma when there is little expectoration; it was formerly relied on to aid the reduction of dislocations and strangulated hernias, and for spasmodic stricture, but chloroform is now preferred in these affections. In advanced typhus Dr. Graves advised doses of one-fourth to one-half a grain with some laudanum, for those serious forms of cerebral disturbance attended with delirium and loss of sleep—a practice requiring much judgment and experience to be safely followed.

Doses varying from one-sixteenth to one-fourth of a grain are expectorant; they are prescribed in bronchitis, recent catarrhs, and the first stage of pneumonia, when there is oppression of breathing, tightness in the chest, and viscid mucous secretion, and are contra-indicated when the circulation is feeble, the surface of the body cold and clammy, the expectoration copious, or there are symptoms of gastric or intestinal irritation. Similar doses will act as a diaphoretic, combined with sudorific remedies, and are in constant use in febrile attacks, and the early stages of measles and scarlatina, when the skin is hot and the pyrexia considerable.

Properties termed sedative, or contra-stimulant, are attributed to large doses of tartar emetic. Rasori used it as an antiphlogistic in a fever at Genoa, in 1808, and afterwards for pneumonia; Laennec gave it in the latter disease in grain doses every hour for six hours, and then suspended it for a time, if the symptoms were less acute; gradually increasing it in severe attacks, until twenty to ninety grains were taken daily in divided doses; it is remarkable that, though at first it nauseates, it is afterwards tolerated in those enormous quantities; they may cause no sensible evacuations; at other times they purge, or act upon the skin, and frequently the pulse falls, beating so slowly as thirty-four to forty-four times in the minute; this practice was recommended for pneumonia, pleuritis, bronchitis, and acute rheumatism; it is now rarely adopted.

Antidotes.—The stomach must be discharged as soon as possible by the stomach pump, or a mustard emetic. Tannin, powdered galls, or yellow cinchona, diffused through water, are recommended to form a tannate of antimony; stimulants with opiates are required to combat the subsequent diarrhœa and collapse; and, should the patient survive, diuretics will aid in eliminating the poison.

Dose.—One to two grains are emetic; one-eighth to one-half a grain nauseates; one-twelfth to one-eighth of a grain is expectorant or diaphoretic; twenty grains are sufficient to cause dangerous symptoms. Some instances are recorded where serious effects have followed comparatively small doses.

VINUM ANTIMONIALE.—Antimonial Wine.—Should be made with sherry, inferior wines decomposing the salt, which forms insoluble compounds with their colouring matter. Each f℥ss. contains one grain of tartar emetic.

Preparation.—Dissolve tartrated antimony, gr. xl., in sherry, Oj.

Dose.—Ten to thirty drops for an expectorant; fʒj. or fʒij. to nauseate; or fʒij. to f℥iv., given every ten minutes, until vomiting ensues. With young children, f℥ss. to fʒij. acts as an emetic.

UNGUENTUM ANTIMONII TARTARATI.—Ointment of Tartrated Antimony.—Should be well mixed, and applied only to the sound skin, as it may cause troublesome ulcers, and even sloughing. With young children, if possible, its use should be avoided. About the bulk of a small nut is rubbed in night and morning, or it is employed spread on lint.

Applied externally in ointment, tartar emetic produces painful pustules, like ecthyma or small pox; it is used as a counter-irritant to the chest in chronic catarrhs, pneumonia, pleuritic stitches, and incipient phthisis; when made into a paste with water, it is inoculated over small nævi to destroy their structure. The ointment has also been rubbed along the spine for severe hysterical affections, and employed as a dressing after blisters, in maniacal attacks, to the scalp, sometimes mixed with mercurial ointment. The practice is most irritating, and should be followed only when indispensable. An eruption of small-sized pustules can be excited by applying a strong solution of tartar emetic to the chest for a liniment, or on lint covered with oiled silk.

Preparation.—The salt in fine powder, one-quarter ounce; simple ointment, ℥j. Mix.

BISMUTH (Bi).—Is a hard, reddish-white metal; brittle, and crystallizing in cubes, like rhombohedrons; it melts at 513°, and expands considerably as it solidifies; exposed to the air at high temperatures, it oxidizes, forming clouds of white oxide. It is obtained in the native state chiefly from Saxony, and extracted by simple fusion from the rock.

Adulterations.—It may contain traces of sulphur and arsenic, which are separated by melting with nitre; its solution in nitric acid, precipitated by an excess of water, and filtered, should not afford evidences of copper or iron when tested.

Tests.—Its soluble acid salts added to water deposit sparingly soluble white subsalts, which are blackened by sulphuretted hydrogen; chromate of potash forms a yellow chromate with bismuth.

BISMUTHUM ALBUM.—**White Bismuth** (BiO_3, NO_5).—Trisnitrate of bismuth is known in commerce as Spanish or pearl white; it is a tasteless, heavy powder; insoluble in water, and dissolved by nitric acid; under the microscope it is observed to consist of minute crystalline scales; if long exposed to light, it will become greyish.

Preparation.—Nitric acid, f℥ijss.; distilled water, f℥iij.; mix, and add bismuth in coarse powder, ℥ij., in successive portions; when effervescence ceases, apply for ten minutes a heat approaching boiling, and decant the solution from any undissolved particles of the metal; evaporate the fluid to f℥ij., and pour it into distilled water, half a gallon; when the precipitate subsides, decant the supernatant liquid, and agitate the sediment with another half gallon of distilled water; after two hours again decant, collect the precipitate on a filter, and dry at a temperature of 212°.

When nitric acid acts on bismuth, a soluble nitrate is obtained, which can be got in transparent crystals, $Bi + 4\,NO_5 = NO_2 + BiO_3, 3\,NO_5$; on adding this to an excess of water, $2\,NO_5$ separates, and the precipitate is a basic trisnitrate, BiO_3, NO_5; a little bismuth remains in solution.

Purity.—Prepared from impure bismuth, it may contain traces of arsenic; the microscope will detect hydrated oxide of bismuth, got by precipitating the nitrate solution with an alkali, as it is amorphous, not crystalline; chalk will effervesce on adding dilute nitric acid; and lead, if present, precipitates as a white sulphate when dilute sulphuric acid is mixed with this solution.

Effects.—Bismuth is principally prescribed for painful affections of the stomach, as gastrodynia and pyrosis; it is a mild astringent, and considered to exert a sedative influence on the gastric nerves: in flatulent distention of the bowels accompanying dyspepsia, it can be given with recently burned charcoal; and for pyrosis the carbonated alkalies, or magnesia and hydrocyanic acid, are often added; in this affection dilute nitric or nitro-muriatic acid with bitters taken before meals is of decided service, and the bismuth best given an hour or so afterwards. When severe gastric pain of neuralgic character occurs at irregular intervals, if it does not yield to small doses of morphia combined with bismuth, the nitrate of silver should be tried. In the chronic diarrhœa of phthisis, and particularly in the diarrhœa that supervenes in typhoid fevers, repeated full doses of subnitrate of bismuth are of remarkable advantage; in the latter cases strong animal broths are not borne, unless well diluted with farinaceous substances, as arrow root or barley jelly, and it is impossible to control the diarrhœa unless this is attended to. In France, bismuth is used for the diarrhœa of children; and Trousseau directs it in enemas with flaxseed tea, in doses of forty grains. When taken internally, it often blackens the stools similarly to iron. A solution of bismuth prepared, I believe, by dissolving oxide of bismuth, recently thrown down, in citrate of ammonia, is sold as Schacht's LIQUOR BISMUTHI; it contains about one and a-half grain in f℥j., and is an elegant and useful formula for internal employment; I have given it in gastric affections with much benefit.

Suspended in water by mucilage, bismuth is used as an injection for gonorrhœa and leucorrhœal discharges. Mixed with four to eight parts of powdered starch, it is applied as a dusting powder to dry up eczematous and other discharging surfaces; its effects are similar to oxide of zinc, over which it has little advantage.

DOSE.—Five to thirty grains of the trisnitrate; of Schacht's solution, fʒj., diluted.

TROCHISCI BISMUTHI.—BISMUTH LOZENGES.—Each contains two grains of bismuth; the dose will therefore be one to six lozenges, taken thrice daily, half an hour or so after meals.

PREPARATION.—White bismuth, 1440 grains; carbonate of magnesia, ℥iv.; precipitated carbonate of lime, ℥vj.; refined sugar, ℥xxx.; gum arabic, in powder, ℥j.; distilled water, f℥vj.; mix thoroughly, and boil until reduced to a proper consistence; then remove from the fire; add oil of cinnamon, fʒss., and again mix thoroughly; divide the mass into 720 square lozenges; dry them in a hot air chamber with moderate heat.

CADMIUM (Cd).—Is occasionally present in zinc ores, and, being volatile, sublimes with the first portions of that metal during reduction, from which it is afterwards separated; its equivalent is 56; it is tin-white, so soft as to mark paper, and fuses at 442°. The IODIDE OF CADMIUM, though not officinal, is used in ointment to disperse indurations, and over inflamed parts, like iodide of potassium. It is got by mixing iodine with filings of cadmium and a little water, is soluble in water and alcohol, and crystallizes in pearly six-sided tables. The salts of cadmium resemble those of zinc.

TESTS.—Sulphuretted hydrogen throws down a yellow sulphide from acid solutions; and yellow prussiate of potash gives a yellow precipitate, soluble in hydrochloric acid.

CHROMIUM (Cr).—Is a hard dark grey metal, brittle, and infusible at a temperature that melts platinum; it is not acted on by acids, except hydrochloric, and forms compounds with oxygen similar to those of iron; the protosalts are little known; the sesquisalts are green or violet-coloured; salts of chromic acid alone possess interest in medicine; their chief source is chrome iron ore.

TESTS.—Chromates give a yellow precipitate with salts of lead, and an orange with subnitrate of mercury; chloride of barium also forms a yellowish-white, and nitrate of silver an orange precipitate, both soluble in dilute nitric acid.

CHROMIC ACID (CrO_3).—This powerful caustic is not pharmacopœial; it is got by mixing four parts of cold saturated solution of bichromate of potash with five of sulphuric acid; as it cools, chromic acid deposits in brilliant crimson needles, which must be dried over vitriol in a bell-glass; it deliquesces in the air, and is easily reduced by contact with organic matters; it fuses at 400°, and at a higher temperature decomposes, becoming incandescent.

EFFECTS.—Used in paste, with water, it penetrates deeply; in solution it rapidly dissolves organic matters, and is applied to warts, condylomata, and ulcerated hæmorrhoids, as an escharotic; 100 grains dissolved in water, f℥j., is the strength generally employed.

BICHROMATE OF POTASH ($KO, 2\,CrO_3$).—Crystallizes in large red four-sided tables, soluble in ten parts of cold water; its taste is cool, bitter, and metallic.

PREPARATION.—Powdered chrome iron is fused with carbonate of potash and some nitre in a reverberatory furnace; the soluble matters dissolved out, and supersaturated with nitric acid, are crystallized, after removing any silica which precipitates.

EFFECTS.—A dangerous irritant poison, in large doses causing convulsions and paralysis; locally it will act as a caustic, forming papulæ which ulcerate on the hands of workmen who use it. In pharmacy it is employed to yield oxygen in preparing valerianic acid.

ANTIDOTES.—Chalk, magnesia, and albumen. Emetics should be promptly given.

COPPER (Cu).—Is the only red-coloured metal; it is malleable, ductile, and tenacious, and remarkable for its peculiar taste and smell; it fuses at 1996°, and when melted absorbs oxygen, the greater part of which passes off as it cools. Copper crystallizes in octohedrons; it does not decompose water at a red heat; in moist air it becomes coated by a green crust of hydrated oxide and carbonate. The principal ores are native copper, the oxides, carbonates, and sulphurets, of which copper pyrites, or sulphide of iron and copper, is most common; from it the metal is obtained by calcining to expel arsenic and sulphur, and to oxidize the iron; it is afterwards fused with siliceous sand, which removes the iron as a slag; the residual sulphide of copper is then reduced, but the metal requires repeated purifications to fit it for commerce.

Tests.—The salts are blue or green; in solution with excess of ammonia they form a deep blue solution; ferrocyanide of potassium causes a chocolate-brown precipitate; and a rod of bright steel dipped in acid solutions becomes coated with metallic copper.

Uses and Effects.—Copper foil is employed in Reinsch's test for arsenic; it frequently contains minute traces of that metal, and requires to be examined before being used; it also detects chlorine in hydrochloric acid, by rapidly tarnishing if that gas is present. Clean copper vessels are not injurious for cooking purposes; it is dangerous to permit food to remain in them, particularly fatty, acid, or saline substances, as they will dissolve copper from the surface, where it becomes oxidized by the air, and may give rise to symptoms of irritant poisoning, such as gastric pain, repeated vomiting and diarrhœa, with cramps and convulsive seizures, and occasionally produce jaundice; the vomited matters are coloured green or blue, and copper can be detected in them. Dr. Corrigan has pointed out a peculiar purple line round the gums of patients suffering from chronic copper poisoning; it is well marked, and affords conclusive proof of the nature of those obscure symptoms they suffer from,—colic, slow fever, cramps, diarrhœa, and irritability of the stomach, which are liable to be mistaken for organic disease.

Antidotes.—Yellow prussiate of potash is the best; as albumen unites with most copper salts, white of egg or gluten may be given; and emetics if required, to aid the expulsion of the poison.

CUPRI SULPHAS.—Sulphate of Copper ($CuO, SO_3 + 5HO$).—This salt, popularly known as blue vitriol, or bluestone, crystallizes in oblique rhombic prisms, which are soluble in four parts of cold or two of boiling water; it loses in dry air four atoms of its water, retaining the fifth until heated to 430°, when it falls into a yellowish-coloured powder, that regains its blue colour on the addition of water; it is insoluble in absolute alcohol.

Preparation.—It can be obtained by dissolving copper in sulphuric acid, adding some nitric acid to oxidize the metal, $3\,Cu + 3\,SO_3 + NO_5 = NO_2 + 3\,CuO, SO_3$; the solution is then evaporated, and crystallized. It is also got in large quantity during the refining of silver in the Mint, the metal being dissolved by sulphuric acid, and subsequently precipitated with copper bars, $AgO, SO_3 + Cu = Ag + CuO, SO_3$.

Impurity.—Some sulphate of iron is frequently present; this is detected by adding to an aqueous solution of the salt twice its volume of solution of chlorine to peroxidize the iron, and then excess of water of ammonia, in which oxide of copper is soluble, and oxide of iron remains undissolved. It is also sold contaminated with sulphate of zinc; solution of ammonia in excess dissolves this oxide, and by bicarbonate of soda or potash it is thrown down in white flakes.

The Pharmacopœia directs commercial sulphate of copper to be recrystallized for medical use, also ANHYDROUS SULPHATE OF COPPER dried at 400°, for detecting the presence of water in alcohol, which restores its blue colour.

EFFECTS.—Large quantities are poisonous, causing the symptoms already described under metallic copper; it corrodes the tissues, forming a blue compound with the albumen, containing ten per cent. of oxide of copper; a child upwards of a year old is reported to have died from its action within four hours; in this instance it produced vomiting and insensibility, but neither diarrhœa nor convulsions. Doses of ten to twenty grains operate as a tolerably certain and rapid emetic; it should be given in solution, and requires caution, being rather dangerous if not speedily expelled by vomiting. Small doses are tonic and astringent; they are prescribed in spasmodic affections, as chorea and epilepsy, and require to be persevered in for months; a little opium is a useful addition, and the fœtid gum resins are often combined with it. In obstinate attacks of diarrhœa, in which there is reason to suspect ulceration of the bowels, and in the latter stages of dysentery, it is highly spoken of. Pereira states that he found it of decided service for checking the chronic diarrhœa of infants, given in doses of one-twelfth of a grain, thrice daily.

Externally it is employed to destroy exuberant granulations in burns and ulcers, and occasionally rubbed to the conjunctival mucous membrane for granular lids, to prevent excessive growth of the hypertrophied papilla; it forms a useful collyrium in chronic ophthalmia, for which purpose weak solutions are preferred; and is sometimes used for vaginal and urethral injections, to arrest leucorrhœal and gonorrhœal discharges.

ANTIDOTES.—Described under "copper."

DOSE.—Astringent and tonic, usually given in pill, guarded with opium, one-fourth of a grain, gradually increased to six grains, thrice daily; ten to twenty grains are emetic. For eye lotions, one or two grains are sufficient in each f℥j. of water.

SOLUTION OF AMMONIO-SULPHATE OF COPPER ($CuO, SO_3 + 2 NH_3, HO$).—A deep azure-blue solution, reacting alkaline from excess of ammonia; exposed to the air, the ammonia passes off, leaving subsulphate of copper. It is used to test arsenious acid, with which it forms Scheele's green; and prescribed occasionally in lotion to relieve the irritation in prurigo. Cullen employed the crystallized salt, like sulphate of copper, for epilepsy and other spasmodic diseases, in doses of half a grain to two grains, thrice daily. Added to water of ammonia, it detects traces of sulphuretted hydrogen, by giving a dark precipitate.

Preparation.—Sulphate of copper in crystals, ℥ss.; distilled water, f℥viij.; add ammonia to the solution until the precipitate first formed is nearly redissolved; clear the solution by filtering, and add distilled water to make up f℥x.

NITRATE OF COPPER ($CuO, NO_5 + 3HO$).—Is prepared by dissolving copper in nitric acid, and evaporating the solution; it forms deep blue oblique rhombic crystals, which readily deliquesce. This salt is not officinal; it is a valuable caustic for syphilitic primary sores, having the property of corroding those parts alone which are abraded or ulcerated, and produces a deep eschar; lint saturated with a strong solution is placed in contact with the surface for two or three minutes, its action is painful, and most effective.

SUBACETATE OF COPPER ($2CuO, C_4H_3O_3 + 6HO$).—Copper forms several compounds with acetic acid; this is distinguished as the diacetate, or verdigris; it is imported in bluish-green masses; its odour is unpleasant and acetous, it tastes styptic and metallic; cold water decomposes it into a soluble and insoluble salt. Verdigris is obtained by placing sheets of copper in the refuse of grapes fermented with sour wine. Taken internally, it causes the usual poisonous effects of copper salts. It is used to prepare the following solution:—

SOLUTION OF ACETATE OF COPPER ($CuO, C_4H_3O_3 + HO$).—Employed to detect butyric acid in valerianate of zinc.

Preparation.—Digest subacetate of copper in fine powder, ℥ss., in acetic acid, f℥j., diluted with distilled water, f℥ss., at a heat not above 212°, repeatedly stirring, and evaporate to dryness; digest this in boiling distilled water, f℥iv., and add more water to make up f℥v.

IRON (Fe).—This metal never exists native unless as a constituent of some meteoric stones, in which it is combined with nickel; its ores are the sesquioxide, or red hæmatite; the hydrated oxide, brown hæmatite; magnetic iron, obtained in great quantity in Sweden; specular iron ore, a splendent form of the red oxide; and the carbonate, or spathose iron, which, in an impure form, constitutes the black band ironstone of Scotland. The sulphides are numerous; they are not employed to yield the metal.

The different oxides are reduced by being smelted with carbonaceous matter at a high temperature; when clay ironstone is employed, a flux, such as lime, is required to combine with the silica of the ore, and produce a fusible slag, which separates from the molten metal.

Cast Iron.—Is comparatively fusible; it cannot be welded or drawn into wire; it contains variable amounts of carbon, at times so much as five per cent., and ranges from a soft and tough condition to one which is brittle and hard.

Steel.—Unites the fusibility of cast iron with the ductility and malleability of pure iron; by sudden cooling it becomes extremely hard and brittle; with slower cooling it can be tempered to retain a remarkable degree of elasticity, together with any desirable amount of hardness.

Pure Iron.—Is softer than steel; at a white heat it welds, and is difficult to fuse; it is malleable, ductile, and possessed of great tenacity. For medical purposes, IRON WIRE and FERRI PULVIS are made use of.

Tests.—The PROTOSALTS, when freshly precipitated, are white, rapidly changing to green; with ferridcyanide of potassium they yield a precipitate, termed Turnbull's blue.

The SESQUISALTS are yellow or brown; with ferrocyanide of potassium they form Prussian blue; with hydrosulphide of ammonium, a black precipitate of hydrated sulphide of iron; and with tannin, in neutral solutions, an inky-black colour; this reaction is rendered more delicate by adding a little water containing bicarbonate of lime previously to the solution.

Effects.—The protosalts of iron possess medical properties more properly termed chalybeate; the persalts are usually styptic and astringent. Chalybeates are indicated in chlorosis, and all affections attended by deficiency of the red blood globules, such as passive hæmorrhages, amenorrhœa, scrofula, and those forms of sciatica and neuralgia where there is pallor and anæmia; they are also employed in the chronic stages of albuminuria, and after recovery from attacks of acute dropsy, the result of cold or scarlatina. Pallor of the face, and the bloodless state of the conjunctiva and caruncle of the eye, afford ready tests of the expediency of its exhibition; the venous murmur in the neck, or *bruit de diable*, is another useful indication for its employment, which usually requires to be persevered in for at least four to six weeks to secure its full advantages. As chlorosis depends on constitutional causes, it is liable to recur some months after treatment, and in such cases it is advisable to renew the ferruginous remedies from time to time. Iron, when given internally, blackens the tongue and the alvine discharges, possibly from the formation of a tannate of iron; it is also liable to excite unpleasant symptoms,—sensations of fulness, and throbbing in the head, feverish excitement, and a tendency to hæmorrhages; some individuals are so susceptible of its action, that they are unable to tolerate even minute doses of the iron salts, particularly the persalts, which are prone to derange the bowels, and seldom agree with those who are full-blooded and plethoric.

FERRUM REDACTUM.—**Reduced Iron.**—This preparation, introduced by M. Quevenne, is a greyish-black powder, strongly attracted by the magnet, consisting of metallic iron in minute subdivision, with a little magnetic oxide; it dissolves in muriatic acid, evolving hydrogen, and when well made, if rubbed in a mortar, exhibits metallic streaks; or, struck on an anvil, it coheres into a brilliant scale of iron; exposed to damp air, it rapidly oxidizes.

PREPARATION.—Peroxide of iron, ℥j., is placed in a gun-barrel, and confined by plugs of asbestos; the gun-barrel raised to a strong red heat in a furnace, and hydrogen gas passed over it, previously dried by passing through sulphuric acid, and then through a tube eighteen inches long filled with fragments of chloride of calcium; the gas is developed from granulated zinc, and sulphuric acid diluted with eight volumes of water; the farther end of the gun-barrel is connected by a cork with a bent tube dipping under water; and when the hydrogen escapes through the water at the same rate as it bubbles through the sulphuric acid, the furnace is allowed to cool to the temperature of the air, still continuing the current of hydrogen; the reduced iron is then withdrawn, and placed in a dry stoppered bottle.

The hydrogen at a red heat reduces peroxide of iron, $Fe_2O_3 + 3H = 3HO + 2Fe$. The metal, being minutely subdivided, must be cold before it is withdrawn from the gun-barrel, as if heated it rapidly oxidizes and bursts into flame.

ADULTERATIONS.—Fine iron filings, the magnetic oxide, and charcoal, are sometimes added; it may also afford traces of sulphide of iron, due to sulphate of soda remaining in the oxide of iron from imperfect washing, which causes eructations of sulphuretted hydrogen when taken internally. The officinal test admits of fifty per cent. of magnetic oxide being present; "ten grains of the iron, gently heated with water; iodine, fifty grains; and iodide of potassium, fifty grains, in a flask, leave not more than five grains undissolved, which should be entirely soluble in hydrochloric acid."

EFFECTS.—It dissolves in the fluids of the stomach, and has the advantage of being tasteless, though it sometimes causes unpleasant belchings of hydrogen gas; its properties are similar to the protosalts of iron; it is prescribed for chlorosis, amenorrhœa, scrofulous affections, and generally where chalybeates are indicated.

DOSE.—Two to ten grains in powder, thrice daily.

FERRI PEROXIDUM HYDRATUM.—HYDRATED PEROXIDE OF IRON ($2Fe_2O_3, 3HO$).—This is a soft reddish-brown magma, soluble in dilute hydrochloric acid, without effervescing; dried at 212°, to remove its uncombined water, it yields more moisture if strongly heated; when long kept it becomes useless, passing into an altered crystalline state.

PREPARATION.—Mix solution of persulphate of iron, f℥iv.; distilled water, Oj.; gradually pour this into solution of soda, f℥xxxiij., stirring well for a few minutes; collect the precipitate on a calico filter, and wash with distilled water until the filtrate ceases to precipitate with chloride of barium; enclose the precipitate, without drying it, in a porcelain pot whose lid is made tight by a luting of lard.

Persulphate of iron with solution of caustic soda yields hydrated peroxide of iron, which precipitates, and sulphate of soda, removed by washing, $Fe_2O_3, 3\ SO_3 + 3\ NaO = Fe_2O_3 + 3\ NaO, SO_3$.

Test.—When calcined, it leaves about twelve per cent. of oxide of iron.

Effects.—It is employed in arsenical poisoning as an antidote; the reaction will be $AsO_3 + 2\ Fe_2O_3 = AsO_5, 4\ FeO$; its effects are most decided when fresh; and for extemporaneous use it can be got by decomposing sesquichloride of iron with solution of soda or ammonia; as it has little influence over undissolved arsenious acid, which is often taken in the state of coarse powder, emetics must be freely used at the same time, and bland viscid substances, as Carron oil, given to aid its suspension and envelope it.

Dose.—A table-spoonful every few minutes, discharging the stomach at intervals.

FERRI PEROXIDUM.—Peroxide of Iron (Fe_2O_3, HO).—A dark reddish-brown powder, tasteless, insoluble in water, and completely dissolved by the aid of heat in hydrochloric acid diluted with half its volume of water; the solution reacts as a persalt of iron. It is known in commerce as rubigo ferri, rouge, and colcothar.

Preparation.—Hydrated peroxide of iron, ʒiv., is dried in an oven, and then exposed to a heat of 212°, until it ceases to lose weight; lastly, when powdered, it is preserved in a bottle.

At 212° the hydrated oxide loses two atoms of water, retaining the third until exposed to dull redness, after which it dissolves with difficulty in acids.

Purity.—It should dissolve completely in hydrochloric acid, and the solution give no precipitate with chloride of barium or ferridcyanide of potassium, showing its freedom from sulphate of soda or protoxide of iron.

Effects.—Used in emplastrum ferri; and sometimes exhibited as a chalybeate, for neuralgia and tic doloroux; it may be well replaced by more active and soluble preparations.

Dose.—Thirty to sixty grains, thrice daily, in electuary or powder.

EMPLASTRUM FERRI.—Chalybeate Plaster.—This is the well-known strengthening plaster or emplastrum roborans, used, spread on leather, as a mechanical support for fractured ribs, weak joints, lumbago, and muscular rheumatism.

Preparation.—Burgundy pitch, ʒij.; litharge plaster, ℥viij.; melt, and add peroxide of iron in fine powder, ʒj., stirring constantly until it stiffens on cooling.

FERRI OXIDUM MAGNETICUM.—**Magnetic Oxide of Iron** (Fe_3O_4).—This preparation contains peroxide of iron, with about nine per cent. of protoxide, and twenty-two per cent. of water; it is a black, tasteless powder, strongly attracted by the magnet; soluble in hydrochloric acid diluted with half its bulk of water, forming no definite salts, but affording mixtures both of proto and persalts. It exists in a native state in octohedral crystals, or massive and anhydrous, constituting magnetic iron ore.

Preparation.—Sulphuric acid, fʒiij.; distilled water, f℥v.; mix, and dissolve in it, with the aid of heat, sulphate of iron, ℥iv.; then mix nitric acid, fʒij., with distilled water, f℥ij., and add it to the former solution; concentrate by boiling until on the sudden disengagement of ruddy vapours the liquid passes from a dark to a red colour; to the solution thus obtained, add sulphate of iron, ℥ij., dissolved in distilled water, Oss.; mix well; add to the liquid solution of soda, f℥lviij., and having boiled for five minutes in an iron vessel, collect the precipitate on a calico filter, and wash with boiling distilled water until the liquid which passes through ceases to precipitate with solution of chloride of barium; lastly, dry the precipitate without heat over a capsule containing sulphuric acid, and preserve it.

In the first part of the process persulphate of iron is obtained (see this preparation). On adding protosulphate of iron, and precipitating the mixed solution with soda, the magnetic oxide falls, $Fe_2O_3, 3\,SO_3 + FeO, SO_3 + 4\,NaO = 4\,NaO, SO_3 + Fe_3O_4$. The sulphate of soda is removed by washing.

Purity.—Twenty grains moistened with nitric acid to peroxidize its protoxide of iron, and calcined at low redness, leave 15·8 grains of peroxide of iron. The presence of protoxide of iron is determined by dissolving twenty grains in hydrochloric acid; the solution gives a blue precipitate with ferridcyanide of potassium until 8·3 measures of the volumetric solution of bichromate of potash are added.

Effects.—It has all the properties of a mild chalybeate, dissolving in the fluids of the stomach. The scales of iron from forges, formerly used medically, consisted in great part of anhydrous magnetic oxide.

Dose.—Five to thirty grains, repeated thrice daily.

LIQUOR FERRI PERCHLORIDI.—**Solution of Perchloride of Iron** (Fe_2Cl_3).—An orange-brown solution, of strongly styptic taste, without odour, of density 1·338, miscible with water and alcohol in all proportions. The salt can be obtained in brown anhydrous scales by passing dry chlorine over red hot iron; when got by evaporating a solution, it forms large red deliquescent crystals, $Fe_2Cl_3 + 6\,HO$, which are decomposed by heat into oxide of iron and hydrochloric acid.

Preparation.—Mix hydrochloric acid, f℥x.; distilled water, f℥v.; add it in successive portions to iron wire, ℥ij., gently heating when the action becomes feeble, so that the entire of the metal may be dissolved; pour into this nitric acid, fʒvi., diluted with distilled water, f℥ij., and evaporate the whole to f℥x.

In this reaction, iron, hydrochloric and nitric acids, yield sesquichloride of iron in solution, water, hydrogen, and binoxide of nitrogen gases, $6\,Fe + 9\,HCl + NO_5 = 3\,Fe_2Cl_3 + 3\,HO + 6\,H + NO_2$. The acids must be separately added, or protochloride of iron and sal ammoniac result, $8\,Fe + 9\,HCl + NO_5 = 8\,FeCl + NH_4Cl + 5\,HO$. It usually happens that traces of nitrous acid are present, from imperfect preparation.

PURITY.—The amount of iron is determined as sesquioxide by diluting fʒj. with water, f℥ij., and adding excess of solution of ammonia; the precipitate, washed and incinerated, weighs 15·62 grains. The absence of protochloride of iron is shown by a dilute solution not precipitating with ferridcyanide of potassium.

EFFECTS.—This solution is powerfully styptic; as it coagulates the blood, it is applied to arrest hæmorrhage from the capillaries and small vessels, and from bleeding, cancerous, and fungous ulcers; when used in a concentrated state to ulcerated surfaces, it acts as a caustic. Injected into nævi, it solidifies the erectile tissue by its chemical action and the subsequent local inflammation. Some have proposed to inject aneurisms with it—a highly dangerous practice, as the altered blood is liable to putrefy, or suppuration and sloughing may ensue, causing secondary hæmorrhage. When used for erectile tumors, it should be diluted with three or four volumes of water. It is employed for preparing,

TINCTURA FERRI PERCHLORIDI.—TINCTURE OF PERCHLORIDE OF IRON.—Its properties are similar to the solution, of which it is one-fourth the strength; sp. gr. 0·992.

PREPARATION.—Mix solution of perchloride of iron, fʒv., with rectified spirit, f℥xv.

EFFECTS.—Used as a styptic to arrest capillary hæmorrhage, and for destroying diphtheric exudations, soft warts, and exuberant granulations. Taken internally, it has long been a favourite popular remedy in chlorosis and anæmic affections, but, like most of the soluble iron persalts, it is decidedly astringent, and liable to cause headach, vertigo, and constipation; besides blackening the alvine evacuations, the iron can be detected in the urine of those taking it, which explains to some extent its power of arresting passive bleeding and mucous discharges from the kidneys and bladder, in which cases its tonic properties also are of service. It is used in small doses for treating leucorrhœal discharges and chronic gleet, and relieves the sympathetic irritability of the bladder occasionally occurring in delicate and nervous females. In scrofulous affections or chlorosis, where simple chalybeates are indicated, the milder protosalts are preferable.

DOSE.—Ten to thirty drops, thrice daily. The drops of this tincture are small-sized, two are considered equivalent to a minim; it is a good solvent for quinine; and should not be prescribed with mucilage, which it gelatinizes.

IODIDUM FERRI.—Iodide of Iron ($FeI+4\,HO$).—This salt forms tabular deliquescent crystals, of pale green colour, having a styptic chalybeate taste; it should dissolve completely in water; by exposure to the atmosphere its solution decomposes into free iodine and oxide of iron, which precipitates; the decomposition is retarded by keeping an iron rod in the solution, to supply fresh iron to the iodine as it is set free; it also keeps well if converted into syrup.

Preparation.—Fine iron wire, ℥jss.; iodine, ℥iij.; distilled water, f℥xij., are introduced into a flask; the mixture gently heated for about ten minutes, and then boiled until the solution loses its red colour. Filter the solution through paper into a dish of polished iron; wash the filter with distilled water, f℥iij., and boil down until a drop taken out on the end of an iron wire solidifies on cooling. Pour out the liquid on a porcelain dish, and when it concretes break into fragments, and enclose them in a stoppered bottle.

The portion of iodide of iron first formed dissolves the excess of iodine, making a deep red solution, which gradually becomes almost colourless by taking up the rest of the iron.

Purity.—It should dissolve in water, leaving only a slight red sediment of oxide of iron, which also contains some iodine, and is often termed an oxyiodide.

Effects.—The action of iodide of iron is that of a mild chalybeate and alterative, resembling in the latter property iodide of potassium; it blackens the evacuations from the bowels, and both iodine and iron can be recognised in the urine of those using it. Dr. Walshe considers it specially suited for cancerous disease attended with anæmia, and it is constantly employed in scrofulous affections, tabes mesenterica, and chronic glandular swellings; in the less rapid form of phthisis with chlorotic symptoms, amenorrhœa, and little tendency to hæmoptysis, it proves of decided service; in all forms of strumo-syphilitic disease it bears a deservedly high reputation, and is useful in relieving secondary syphilitic symptoms occurring in debilitated and scrofulous patients. In lotions it is sometimes applied to syphilitic and lupoid ulcers; an ointment composed of sixty grains, mixed with lard, ℥j., is recommended to disperse glandular swellings; and for leucorrhœal discharges, injections are sometimes prepared by dissolving thirty to sixty grains in water, f℥viij.

Dose.—Two, gradually increased to ten grains, preferably given in solution.

PILULA FERRI IODIDI.—Pill of Iodide of Iron.—This mass is best prepared as required; in each 3·6 grains it contains one grain of iodide of iron.

DOSE.—One or two pills, thrice daily. It is intended to afford a substitute for "Blancard's pills,"—an efficient preparation, made with the iodide and reduced iron.

PREPARATION.—Agitate iodine, eighty grains; fine iron wire, forty grains; distilled water, fifty minims, in a strong stoppered one ounce phial, until the froth becomes white; pour this fluid on refined sugar, seventy grains, in a mortar; triturate briskly, and add powdered liquorice, 140 grains. Mix.

SYRUPUS FERRI IODIDI.—SYRUP OF IODIDE OF IRON.—When well made is pale green, and will not blue starch unless an acid is added, its iodine being in combination; it bleaches in sunlight, forming some hydriodic acid, and is best preserved by being placed when hot in small bottles tied over with bladder, and coated by varnish. Pure dry iodine should be used to obtain a syrup of full strength, and free from traces of lead found in commercial iodine. Each fʒj. contains 4·3 grains of FeI, the product measuring nearly f℥xxxj.

PREPARATION.—Digest iodine, ℥ij.; fine iron wire, ℥j.; distilled water, f℥iij., in a flask, with gentle heat, until the froth becomes white; filter the liquid while hot into a syrup made by dissolving refined sugar, ℥xxviij. in distilled water, f℥x.; the produce should weigh lbs. ij. ℥xj., and have sp. gr. 1·385.

EFFECTS.—An excellent tonic for strumous affections, glandular enlargements, and secondary syphilitic disease, occurring in broken-down states of the system; it is also of service in treating chronic cutaneous eruptions, as impetigo, in delicate children, for whom it should be diluted with water and syrup of orange, which enables us to give it in tea-spoonful doses.

DOSE.—For the adult, twenty drops to fʒj., thrice daily.

SULPHURET OF IRON (FeS).—There are several native sulphurets of iron, the most interesting being iron pyrites FeS_2, and mispickel, the arsenical sulphuret, $FeS_2 + FeAs$. The PROTOSULPHIDE is obtained artificially by fusing sulphur and iron together at a strong white heat; they unite readily, and the resulting compound is cooled and granulated by falling into a vessel of water; its colour is yellow, and metallic-looking; when pure, it dissolves completely in dilute hydrochloric or sulphuric acid, evolving sulphuretted hydrogen, for which purpose it is officinal.

FERRI SULPHAS.—SULPHATE OF IRON ($FeO, SO_3 + 7 H\dot{O}$).—Commonly termed copperas, or green vitriol; forms pale-green, transparent, oblique rhombic crystals, of styptic chalybeate taste, which effloresce slightly in dry air, and become coated with an insoluble brown crust, composed of Fe_2O_3, 2 SO_3; it dissolves in two parts of cold water, and does not melt in rectified spirit; crystallized at 176°, it can be procured in right-rhombic prisms with 4 HO. According to Pelouze, its colour varies, being bluish when deposited in acid solutions, pale green from those that are neutral, and emerald green from liquids containing some persulphate of iron. It is largely obtained by roasting iron pyrites, exposing them to the air to absorb oxygen, and dissolving out and crystallizing the resulting sulphate of iron.

Preparation.—Iron wire, ℥iv.; distilled water, Ojss.; place in a porcelain capsule; add sulphuric acid, f℥iv., and when the disengagement of gas nearly ceases, boil for ten minutes; filter through paper, and, after resting twenty-four hours, separate the crystals which are deposited; dry them on filtering paper placed on porous bricks, and preserve in stoppered bottles.

The iron decomposes water, evolving hydrogen, and the resulting oxide of iron unites with the acid, $Fe + HO, SO_3 = FeO, SO_3 + H$. The nascent gas prevents the iron from becoming a peroxide during the process.

Purity.—It should be free from the rusty basic persulphate, which is insoluble in water; the absence of persulphate is shown by its precipitate with ferrocyanide of potassium being nearly white; traces of copper, if present, are recognised by dipping a steel knife into an acidulated solution, when it becomes coated with metallic copper.

Effects.—This salt has been given in excessive quantities, as ℥ss., and upwards, to procure abortion; it causes violent irritant symptoms, abdominal pain, vomiting, and diarrhœa; and even death has resulted in the course of a few hours. Full medical doses are liable to be followed by unpleasant effects—occasionally, like other ferruginous salts, exciting gastric disturbance, nausea, a feeling of fulness in the head, and constipating the bowels. It is ordinarily prescribed for chlorotic affections, combined with aloetics, myrrh, and oil of savin; and is a useful chalybeate in treating chronic mucous discharges, as leucorrhœa; after passive hæmorrhages; or in the quiescent stage of Bright's disease, to improve the condition of the blood. Weak solutions of this salt in cold water are recommended to be used daily by injection for prolapse of the rectum; they should be retained as long as possible. By Velpeau it was employed in ointment, or saturated solution, to check the extension of the rash in erysipelas, a practice seldom followed.

Dose.—One to five grains, in pill or mixture; it can be agreeably given whilst effervescing. If dissolved in water, it should be boiled to expel the oxygen, which decomposes the salt.

FERRI SULPHAS GRANULATA.—Granulated Sulphate of Iron.—Is obtained in minute crystals, less green, and tasting less styptic than the ordinary sulphate, with which it agrees in chemical properties.

Preparation.—Iron wire, ℥iv.; distilled water, Ojss.; place in a porcelain capsule, and add sulphuric acid, f℥iv.; when the disengagement of gas nearly ceases, boil for ten minutes, and filter the solution into a jar with rectified spirit, f℥viij., stirring the mixture so that the salt shall separate in minute granular crystals; decant off the adhering liquid, and dry the salt on filtering paper upon porous bricks, by exposure to the atmosphere; preserve in closed vessels.

The spirit throws down the salt in minute crystals, dissolves any persulphate accidentally present, and excludes water from lodging between the plates of the crystals, which renders them liable to oxidize. The neck of the funnel during filtering should dip into the spirit, as slight exposure to air injures the preparation.

Dose and Effects.—Similar to the sulphate of iron, for which it should be substituted as far as possible.

SOLUTION OF SULPHATE OF IRON.—A test solution for nitric acid, with which it forms an olive-green or blackish colour. (See Sulphuric Acid, and Sweet Spirit of Nitre.) It should be recently made.

Preparation.—Granulated sulphate of iron, gr. x.; boiling distilled water, f℥j. Dissolve.

FERRI SULPHAS EXSICCATA.—**Dried Sulphate of Iron** ($FeO, SO_3 + HO$).—The sulphate when dried loses six atoms of water, retaining the seventh atom until heated to 500°; a red heat decomposes the salt. It is a yellowish-white powder, useful for making pills; three grains being equivalent to five of the crystals.

Dose.—Half a grain to three grains, thrice daily.

Preparation.—Expose sulphate of iron, ℥iv., in a porcelain capsule to moderate heat, which may be finally raised to 400°, until aqueous vapours cease to be given off; finally, powder the residue, and preserve in a stoppered bottle.

SOLUTION OF PERSULPHATE OF IRON (Fe_2O_3, $3\ SO_3$).—A dark red viscid solution, of sp. gr. 1·441, inodorous, and highly astringent; soluble in alcohol, and water; by evaporation it yields a deliquescent mass, from which a red heat expels the acid.

Preparation.—Sulphuric acid, fʒvj.; distilled water, f℥x.; mix; add sulphate of iron, ℥viij., and dissolve with the aid of heat; to this add nitric acid, fʒiv., diluted with distilled water, f℥ij.; concentrate by boiling until ruddy vapours are suddenly disengaged, and the liquid ceases to be black, acquiring a red colour; test a drop of the solution with ferridcyanide of potassium; and if a blue precipitate forms, add a few additional drops of nitric acid, and boil, so that the whole of the protosulphate may be converted into persulphate of iron; when the solution is cold, with the addition of distilled water, if necessary, make its bulk f℥xj.

This reaction can be written $6\,FeO, SO_3 + NO_5 + 3\,SO_3 = NO_2 + 3.\,Fe_2O_3, 3\,SO_3$. When sulphate of iron is boiled with nitric acid, the iron is peroxidized, NO_2 being absorbed by the solution, rendering it dark coloured, until subsequently expelled by heat. The sulphuric acid is necessary to prevent a basic sulphate from depositing, and to form a sesquisulphate.

Purity.—Its strength is determined by adding excess of ammonia to fʒj. of the solution; the resulting sesquioxide of iron, washed and incinerated, should weigh 11·44 grains.

Effects.—This solution is officinal for making hydrated peroxide of iron, and several ferruginous preparations, into which the oxide enters. It is much valued in America under the name of Monsel's styptic, for checking hæmorrhage, for which purpose it is recommended both locally and internally; it exists in some chalybeate springs—as Moffatt and Cransac; and can be prescribed with small doses of Epsom salts, as an artificial mineral water.

Dose.—Five to ten drops, well diluted.

LIQUOR FERRI PERNITRATIS.—Solution of Pernitrate of Iron ($Fe_2O_3, 3\,NO_5$).—A powerful astringent, reddish-brown solution, sp. gr. 1·107, from which crystals are difficult to obtain, owing to its forming an insoluble basic nitrate on evaporating. Mr. Kerr, by whom the preparation was introduced, recommended the addition of a few drops of muriatic acid to increase its stability; in preparing it the nitric acid should be used diluted and cold, as strong nitric acid yields an instable protonitrate.

Preparation.—Nitric acid, f℥iij.; distilled water, f℥xvi.; mix, and add iron wire, free from rust, ℥j.; leave them until the metal is dissolved, moderating the action, if it becomes too violent, by adding a little more distilled water; filter the solution, and with distilled water make its bulk Ojss.

The reaction with the iron and acid will be $2\,Fe + 4NO_5 = Fe_2O_3, 3NO_5 + NO_2$, which passes off.

Purity.—It is liable to decompose, becoming turbid, and depositing a basic nitrate of iron; its strength is tested by precipitating fʒj. with excess of ammonia; the resulting peroxide of iron, washed, dried, and incinerated, should weigh 2·6 grains.

Test.—On adding to the solution in a test tube half its volume of pure sulphuric acid, and then solution of sulphate of iron, the whole becomes dark brown coloured, from the nitric acid present.

Effects.—This solution is tonic, and intensely astringent; it is prescribed to check obstinate diarrhœa attended with ulceration of the bowels; for the colliquative diarrhœa of phthisis; and for children affected with mesenteric disease. Dr. Graves considered it of peculiar service in treating nervous and delicate females, suffering from chronic bowel complaints. By several American physicians it is asserted to be superior to all other remedies in dysentery, for which it is claimed to be a specific of equal value to quinine for periodic diseases; it appears best suited for relieving chronic and hæmorrhagic cases. It is also used for uterine and intestinal hæmorrhages, occurring in pale and debilitated patients; and for leucorrhœal discharges it is given internally, and made into a vaginal injection by dilution with water. In the diarrhœa of infancy it is occasionally advised in enema, for which purpose two to eight drops may be added to some tepid water, or starch mucilage.

Dose.—Five to thirty drops, taken three or four times daily, in water, or decoction of logwood.

FERRI ARSENIAS.—**Arseniate of Iron** ($3FeO, AsO_5$, partly oxidated).—A tasteless green-coloured powder; insoluble in water, and readily dissolved by hydrochloric acid; as it contains both protoxide and peroxide of iron, it precipitates with ferrid- and ferro-cyanide of potassium, more abundantly with the latter.

Preparation.—Dissolve arseniate of soda, dried at 300°, ʒiv.; acetate of soda, ℥iij., in boiling distilled water, Oij.; and sulphate of iron, ℥ix., in boiling distilled water, Oiij.; mix the solutions; collect the white precipitate on a calico filter, and wash until the washings cease to precipitate with a dilute solution of chloride of barium; squeeze the precipitate between folds of strong linen in a screw press, and dry it on porous bricks in a warm chamber whose temperature shall not exceed 100°.

Sulphate of iron and arseniate of soda form insoluble arseniate of iron, sulphate of soda, and free sulphuric acid. To remove the latter, which would redissolve the arseniate of iron, acetate of soda is employed, yielding an additional atom of sulphate of soda and acetic acid, $3\,FeO, SO_3 + 2NaO, HO, AsO_5 = 3\,FeO, AsO_5 + 2\,NaO, SO_3 + SO_3HO$, this $+ NaO, C_4H_3O_3 = NaO, SO_3 + C_4H_3O_3, HO$.

Tests.—Arsenic acid is detected by boiling a small quantity of the salt with excess of caustic soda, filtering, exactly neutralizing with nitric acid, and adding nitrate of silver solution, which produces brick-red arseniate of silver. By dissolving this in muriatic acid, and adding zinc, arseniuretted hydrogen escapes, which, when burned, deposits metallic arsenic on a porcelain plate held within the flame. (See Marsh's Test.)

Purity.—Twenty grains, dissolved in excess of hydrochloric acid, diluted with water, give a blue precipitate with ferridcyanide of potassium, until at least seventeen measures of the volumetric solution of bichromate of potash are added, which peroxidizes the protoxide of iron present.

Effects.—It is occasionally prescribed for scaly and eczematous eruptions, and lupus, in doses of one-sixteenth to one-fifth of a grain; its alleged beneficial effects in cancer—for which it was recommended—are more than doubtful. Externally it is sometimes used for cancerous and other chronic ulcerations, in ointment made by triturating twenty to thirty grains in fine powder with cerate, ℥j.; or dusted over the part, mixed with four to six times its weight of phosphate of iron, in the manner employed by Mr. Carmichael; it causes considerable pain, and in a few days a slough is formed; the risk of absorption of the arsenic must be attended to.

FERRI PHOSPHAS.—Phosphate of Iron ($3FeO, PO_5$, partly oxidated).—Is a slate-blue powder, containing some phosphate of the peroxide, PO_5, Fe_2O_3, and precipitating with ferro- and ferridcyanide of potassium, chiefly with the latter; it dissolves in muriatic acid, and is insoluble in water or dilute acetic acid; according to Wittstein, its composition is liable to considerable variation.

Preparation.—Sulphate of iron, ℥iij.; boiling distilled water, Oij.; dissolve, and add phosphate of soda, ℥ijss.; acetate of soda, ℥j.; also dissolved in boiling distilled water, Oij.; mix, and stir carefully; transfer the precipitate to a calico filter, and wash with hot distilled water until the washings cease to precipitate with chloride of barium; finally, dry on porous bricks at a temperature not above 100°.

The process resembles that for the arseniate, acetate of soda being added to replace free sulphuric by acetic acid, $3\,FeO, SO_3 + 2\,NaO, HO, PO_5 + NaO, C_4H_3O_3 = 3\,FeO, PO_5 + 3\,NaO, SO_3 + C_4H_3O_3, HO$.

Test.—Phosphoric acid is recognised by adding to the salt dissolved in hydrochloric acid, tartaric acid, with excess of ammonia, and then solution of ammonio-sulphate of magnesia, which deposits the crystalline triple phosphate of ammonia and magnesia.

Purity.—The absence of arsenic is shown by boiling a slip of bright copper in the hydrochloric solution; it remains unchanged, whilst traces of arsenic would coat it with dark metal. (See Reinsch's Test.)

Effects.—Numerous phosphates of iron have been employed in medicine; the above is considered of service as a mild chalybeate, and given for scrofulous affections, chlorosis, and some forms of dyspepsia; also in anæmia and debility, resulting from venereal excesses, or over-study; and depressing nervous symptoms, attended with an inordinate secretion of phosphates in the urine; being soluble in mineral acids, it can be prescribed in solution.

Dose.—Five to ten grains, thrice daily; or the syrup may be used.

SYRUPUS FERRI PHOSPHATIS.—Syrup of Phosphate of Iron.—Each fʒj. of this syrup contains one grain of phosphate of iron in solution; it forms an agreeable ferruginous tonic.*

Preparation.—Granulated sulphate of iron, 224 grains; distilled water, f℥iv.; dissolve, and mix with phosphate of soda, 200 grains; acetate of soda, 74 grains, also dissolved in distilled water, f℥iv.; after careful stirring, place the precipitate on a calico filter, and wash with distilled water until the filtrate ceases to be affected with chloride of barium; press the precipitate strongly between folds of bibulous paper; add to it dilute phosphoric acid, f℥vss., and when dissolved filter the solution; add refined sugar, ℥viij., and dissolve without heat; the product should measure exactly f℥xij.

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* I find it is liable to become brown-coloured after a time, from the presence of some acetate of iron, introduced by using acetate of soda and imperfectly washing the precipitate; Greenish's original formula is therefore preferable, in which carbonate is used instead of acetate of soda.

The recently precipitated phosphate of iron is redissolved by the phosphoric acid, and formed into syrup.

Use.—A convenient formula for administering this salt in the state of syrup; it must not be given with alkalies, which decompose it.

Dose.—Thirty drops to fʒj., thrice daily.

FERRI CARBONAS SACCHARATA.—Saccharated Carbonate of Iron (FeO, CO$_2$).—When freshly precipitated, carbonate of iron is white; it rapidly assumes a green colour, and, losing carbonic acid, and absorbing oxygen, passes into the brown peroxide; this change is retarded to a considerable extent by sugar, which appears to act by excluding the air; if the preparation is good, it affords about forty-five per cent. of carbonate; it is described as occurring in small cohering greyish-brown lumps, of sweet, feebly chalybeate taste.

Preparation.—Dissolve sulphate of iron, ℥ij.; carbonate of soda, ℥ijss., each in half a gallon of boiling distilled water; mix, and stir briskly in a deep cylindrical vessel, which is then to be covered as accurately as possible; set the mixture by for twenty-four hours, and separate the supernatant liquid with a syphon from the precipitate which subsides; pour on a gallon of boiling distilled water, stir well, and after subsidence again remove the clear liquid; collect the precipitate on a calico filter, press it, and then rub with refined sugar, ℥j., in a porcelain mortar; finally, dry this at a temperature not above 212°.

Sulphate of iron and carbonate of soda interchange their components, $FeO, SO_3 + NaO, CO_2 = FeO, CO_2 + NaO, SO_3$; the latter is removed by the water, being soluble.

Purity.—If dried at too high a temperature, the sugar chars, and the iron is peroxidized; it also decomposes slowly by keeping, becoming brown-coloured; twenty grains, dissolved in excess of hydrochloric acid, diluted with water, should precipitate with ferridcyanide of potassium, until at least thirty-three measures of the volumetric solution of bichromate of potash are added.

Effects.—A mild and useful chalybeate, that seldom disagrees, particularly valued in the diseases of children, and for delicate females. It is sometimes added to cubebs, when treating chronic cases of gonorrhœa.

Dose.—Five to thirty grains, thrice daily.

PILULA FERRI CARBONATIS.—Pill of Carbonate of Iron.

Dose.—One to three pills, thrice daily.

Preparation.—The saccharated carbonate, ℥j.; confection of roses, one quarter ounce. Mix.

MISTURA FERRI COMPOSITA.—Compound Iron Mixture.—Griffith's myrrh, or antihectic mixture, when freshly made, is green; it becomes brown by absorbing oxygen, and losing carbonic acid; hence it should be prepared as required, and kept in closed vessels.

Preparation.—Myrrh, in powder, 60 grains; carbonate of potash, 25 grains; sugar, 60 grains; spirit of nutmeg, fʒj.; triturate with rose water, f℥vij., gradually added until a uniform mixture is obtained; to this add sulphate of iron, 30 grains, in rose water, f℥j., and place the mixture in a bottle, which should be tightly corked.

Carbonate of potash and sulphate of iron are decomposed, the resulting carbonate of iron making the mixture green; the potash, being in excess, unites with the myrrh, forming an emulsion. Pharmaceutists consider this mixture is better made by using a pure lump of myrrh, not too old or hard.

Effects.—A useful tonic in chlorosis, anæmia, and amenorrhœa, and in the early stages of phthisis, when accompanied by chlorotic symptoms.

Dose.—f℥ss. to f℥j., thrice daily.

MISTURA FERRI AROMATICA.—This mixture, termed Heberden's ink, though omitted from the pharmacopœia, is a favourite remedy with many practitioners, where an exceedingly mild chalybeate is required, combined with tonics.

Dose.—f℥ss. to f℥ij., twice or thrice daily.

Preparation.—Crown or pale bark, ℥j.; calumba, ʒiij., each in coarse powder; cloves bruised, ʒij.; filings of iron, ℥ss.; digest for three days with sufficient peppermint water to give f℥xij. when filtered; then add tincture of cardamoms, f℥iij.; tincture of orange, fʒiij. Mix.

FERRUM TARTARATUM.—Tartrated Iron (Fe_2O_3, $KO\ C_8H_4O_{10} + HO$).—The tartrate of iron and potash forms thin garnet-coloured scales, transparent, and of styptic taste, which deliquesce in moist air; soluble in water, and sparingly soluble in spirit. To succeed in obtaining this and similar preparations in scales, a moderate temperature should be used, not above 80° or 90°, and the glass plates on which they are spread reversed whilst drying.

Preparation.—Solution of persulphate of iron, f℥iv.; distilled water, Oj.; mix, and gradually pour into solution of soda, Oij., stirring well for a few minutes; collect the precipitate on calico, and wash with distilled water until the fluid ceases to become turbid with chloride of barium; add the precipitate to acid tartrate of potash in powder, ℥ij.; distilled water, f℥xxx., in a capsule, and digest for six hours, repeatedly stirring, at a heat carefully prevented from rising above 140°; when the solution cools to the temperature of the atmosphere, decant it off any undissolved precipitate, and, having poured it in a thin layer on flat porcelain or glass plates, evaporate to dryness at a heat not above 140°; remove the dry scales, and preserve them in bottles.

The freshly precipitated sesquioxide of iron replaces the basic water of the acid tartrate of potash, producing a double salt, $Fe_2O_3 + KO, HO, C_8H_4O_{10} = KO, Fe_2O_3, C_8H_4O_{10} + HO$. If the heat is raised too high, insoluble tartrate of protoxide of iron is obtained, with tartrate of potash.

Test.—The iron is so intimately combined in this salt, that the addition of an acid is required before it strikes a blue colour with ferrocyanide of potassium.

Purity.—Boiled with soda, it should not give off ammonia, which distinguishes it from a corresponding ammonia salt met in commerce; fifty grains incinerated at a red heat, the residue acted on with hydrochloric acid, and then digested with a little nitric acid, and afterwards diluted with water, f℥iv., and supersaturated by ammonia, yields a precipitate of iron peroxide, weighing 14·92 grains.

Effects.—This favourite chalybeate is much used in treating the diseases of children, and for delicate females; it has little astringence, and seldom disagrees; it is particularly adapted for scrofulous affections, and to improve the condition of the blood after exhausting maladies, as the acute nephritis and dropsy resulting from cold or scarlatina, and for chlorotic and anæmic patients. In cases of chronic cystitis, a combination of the tartrate of iron, cream of tartar, and minute doses of cubebs, proves of decided service.

Dose.—Five to fifteen grains, thrice daily, dissolved in water or in white wine.

VINUM FERRI.—Wine of Iron.—This preparation is better suited for extemporaneous manufacture; if exposed to light, Mr. H. Draper finds an insoluble prototartrate deposits, and he advises the ammonio-citrate of iron in preference; with one-half its weight of citrate of ammonia added, it forms a clear and pleasant solution.

Dose.—f℥j. to f℥ij.

Preparation.—Tartrated iron, 160 grains; sherry, Oj. Dissolve.

FERRI ET AMMONIÆ CITRAS.—Citrate of Iron and Ammonia ($Fe_2O_3, NH_4O, HO, C_{12}H_5O_{11} + 2\,HO$)?—This salt forms thin hyacinth-red scales, with a tinge of olive-green; of sweet, slightly chalybeate taste; dissolving in water, and nearly insoluble in spirit; its aqueous solution is decomposed by caustic potash or soda, depositing peroxide of iron.

Preparation.—Solution of persulphate of iron, f℥viij.; distilled water, Oij.; mix, and gradually pour the dilute solution into solution of ammonia, f℥xiv., stirring well for a few minutes; collect the hydrated peroxide of iron on calico, and wash with distilled water until the filtrate ceases to become turbid on adding chloride of barium; then digest the oxide with citric acid, ℥v., dissolved in distilled water, Oij., at a boiling heat; make the solution neutral by adding solution of ammonia, and evaporate it to dryness in thin layers on flat porcelain or glass plates; preserve the dry salt in bottles.

The citric acid, being tribasic, is saturated with peroxide of iron and ammonia, water probably forming its third basic atom. It is best obtained in scales by using a lower temperature, not above 80° or 90°. Like the tartrate, it requires an acid to be added before striking a blue colour with ferrocyanide of potassium.

PURITY.—Incinerated, with exposure to the air, it leaves 26·5 per cent. of peroxide of iron; it is not subject to intentional adulteration, but may contain traces of lead and copper.

EFFECTS.—Similar to the tartrate; neither salts are decidedly astringent; they act as simple mild chalybeates, and are not liable to disorder the stomach; from their slight taste, they are well adapted for children, and delicate persons suffering from chlorotic affections, or diseases requiring a mild preparation of iron.

DOSE.—Five to fifteen grains, taken thrice daily, and continued for five or six weeks, if necessary; tincture of orange improves its flavour, if used in solution.

FERRI ET QUINIÆ CITRAS.—CITRATE OF IRON AND QUINIA.—Is sold in greenish golden-yellow scales, tasting strongly bitter and chalybeate; somewhat deliquescent, and soluble in cold water; it contains sixteen per cent. of quinine, with per and protoxide of iron and citric acid; when obtained by the following process, its colour is usually dark, with an olive-green tinge.

PREPARATION.—Dissolve sulphate of iron, ℥j., in distilled water, f℥x.; add solution of persulphate of iron, f℥iij., and pour the mixture into solution of soda, f℥xxxvj., constantly stirring; collect the precipitate on calico, and wash with distilled water so long as the washings precipitate with chloride of barium; dissolve citric acid in crystals, 2¼ ounces, in distilled water, f℥xx.; add to this the oxide of iron, and digest on a water bath until a solution is obtained; dissolve sulphate of quinia, 380 grains, in distilled water, f℥viij., acidulated with a little dilute hydrochloric acid; add sufficient solution of chloride of barium to precipitate the sulphuric acid, and filter; then treat the solution with slight excess of ammonia; collect the precipitate on a paper filter, and wash with distilled water until chloride of barium (*this should be nitrate of silver*) dropped into the filtrate gives but a slight precipitate; transfer the washed quinia to the capsule containing the citrate of iron, and digest on a water bath until the alkaloid is dissolved; lastly, evaporate the solution in thin layers on porcelain or glass plates, at a temperature below 212°, and preserve the dry flakes in bottles.

The mixed oxides of iron got from the proto and persulphates precipitated by soda, dissolve in citric acid; to this pure quinia is added, and the resulting salt obtained in flakes. It is necessary to convert the sulphate into muriate of quinia, and then decompose it by ammonia, as, if thrown down from the sulphate directly, it always carries with it some sulphuric acid, which would subsequently separate as sulphate of quinia; whilst any traces of basic muriate of quinia formed are comparatively soluble, and do not affect the result.

Purity.—The following test will detect cinchonia, and also any deficiency of quinia, which is not uncommon:—fifty grains, dissolved in water, f℥j., with slight excess of ammonia, give a white precipitate, which, washed and dried, weighs eight grains; it dissolves in ether, leaves no residue when burned, and if dissolved with an acid, and treated with purified animal charcoal to decolorize it, turns the plane of polarization strongly to the left, whilst cinchonia would rotate it to the right, and is insoluble in ether.

Effects.—It combines the tonic effects of quinia with the chalybeate properties of iron, and is employed in doses of three to eight grains, in pill or solution.

GOLD (Au).—Is obtained in the metallic state disseminated through alluvial soil, and in veins of primitive rock, particularly quartz; it often contains traces of silver and other metals; fine gold, free from these impurities, is used in testing; when pure, it is nearly as soft as lead, ductile, and very malleable; it fuses at 2016°, and is unchanged by exposure to air.

Tests.—Gold is recognised by its solubility in chlorine solutions; its soluble salts are decomposed when heated with sulphate of iron, oxalic, or sulphurous acids; and with mixed proto and perchloride of tin they form the purple powder of Cassius.

SOLUTION OF TERCHLORIDE OF GOLD ($AuCl_3$).—A fluid of fine yellow colour, giving, when evaporated, a deep red deliquescent mass, decomposed with heat, leaving a residue of pure gold; it is employed to test the aqueous solution of atropia, with which it forms a citron-yellow precipitate; and occasionally as a caustic for lupoid and syphilitic ulcers. The salt, used internally in doses of one-tenth of a grain, is considered to resemble corrosive sublimate in its effects; it has been chiefly prescribed for tertiary syphilis.

Preparation.—Place fine gold, in a thin lamina, 60 grains, in a flask with nitric acid, f℥j.; hydrochloric acid, f℥vj., first mixed with distilled water, f℥iv., and digest until dissolved; add hydrochloric acid, f℥j., and evaporate at a heat not exceeding 212°, until acid vapours cease to be given off, and dissolve the salt thus obtained in distilled water, f℥v.; preserve in a stoppered bottle.

The reaction consists in gold being converted into terchloride, chloronitrous acid escaping, and water being formed, $3\,NO_5 + 9\,HCl + 2\,Au = 9\,HO + 3\,NO_2Cl + 2\,AuCl_3$.

LEAD (Pb).—A soft bluish metal, sp. gr. 11·4, having a peculiar odour when handled; it oxidizes superficially in the air, and is not acted on by pure water; but ordinary waters, which contain dissolved oxygen and carbonic acid, form an hydrated oxide and carbonate, that render them poisonous if left long in contact with leaden pipes or cisterns; sulphates, chlorides, and phosphates protect the lead from this solvent action, by coating it with insoluble salts, whilst nitrates increase its solubility. Lead fuses at 612°; when melted, it rapidly oxidizes, and by slow cooling can be got in octohedra; it is obtained by roasting galena, PbS, at a dull red heat until much of the sulphur is expelled, and some sulphate of lead results; on raising the heat, this is reduced with the unchanged sulphuret, $PbO, SO_3 + PbS = 2Pb + 2\ SO_2$.

Tests.—Soluble lead salts give white precipitates with carbonate or sulphate of soda, of carbonate or sulphate of lead; with iodide of potassium, a yellow iodide of lead, dissolved by boiling water, and deposited on cooling in golden spangles; with bichromate of potash, the yellow chromate of lead; sulphuretted hydrogen will blacken all these precipitates; lastly, its salts are reduced with charcoal before the blowpipe, yielding metallic lead.

Effects.—The metal appears inert; its compounds, with few exceptions, are poisonous; thus the sulphide does not seem injurious, and there are some doubts about the action of the sulphate. Its soluble preparations, in small repeated doses, are astringent, arrest hæmorrhagic discharges; and when absorbed render the pulse smaller and slower, exercising a decided sedative influence over the secretions.

When the system becomes impregnated with lead from any cause, such as using it medically for long periods, drinking water, wines, or cider contaminated by it, or from exposure to its influence in certain trades—painting, plumbing, white-lead manufactures, &c.,—distinctive symptoms occur, that denote its presence: the person assumes a sallow, unhealthy appearance; his skin has a dull, earthy hue, termed saturnine icturus; a metallic sweet taste is complained of, and the gums acquire a dark-blue line round the teeth; this mark, described by Dr. Burton, is pathognomonic of lead poisoning; and the buccal mucous membrane may become similarly stained. The colour is ascribed to the formation of sulphide of lead; it appears to originate in a deposition of metallic lead in the tissues of the gum; and other metals, especially copper and silver, are deposited in the same manner. After a variable interval, the special saturnine maladies are developed:—

1. Lead colic is by far the most frequent affection; it may commence suddenly, or be preceded by dyspeptic symptoms; there is severe colicky pain, usually relieved by pressure; hardness and retraction of the abdomen; nausea, dysuria, and obstinate constipation. Des-Planches considers this state to arise from neuralgia of the digestive and urinary organs; others attribute it to a paralytic condition of the intestinal muscular fibres.

2. Arthralgia, characterized by wandering pains in the limbs; occasionally occurring in acute paroxysms, with cramps.

3. Paralysis, with loss of voluntary motion, which in general attacks those who have already suffered from colic; the extensor muscles of the forearm are most often affected, causing a drooped condition of the wrist; after a time the muscles become pale and wasted, particularly the ball of the thumb; pain may be complained of, or anæsthesia accompany the paralysis, or exist independent of it.

4. Saturnine cerebral affections, of which four forms are described, according as delirium, coma, convulsions, or a union of the entire, constitute the leading symptoms.

Acute poisoning from lead is rare; it induces gastro-enteric disturbance, with cramps, severe vomiting, obstinate constipation, and collapse; in some instances purging will set in; after recovery, the lead is eliminated through the kidneys, the skin, and possibly by the bowels; when the dose is large, subsequent local paralysis often ensues.

ANTIDOTES.—In acute poisoning, the stomach should be emptied by emetics or the stomach pump, and sulphate of soda or magnesia given to form sulphate of lead, which is nearly inert. For lead colic, purgatives are employed, followed by or combined with opiates, and warm stupes to the abdomen; enemas are also of service. In paralysis, the wrists are supported by splints, passive motion and galvanism used at intervals; blisters applied along the course of the nerves, and strychnia prescribed internally or endermically; after the immediate symptoms are relieved, iodide of potassium is recommended by Melsens, to eliminate any lead remaining in the system.

To obviate chronic poisoning in lead manufactories, besides extreme cleanliness, the daily use of sulphuric acid lemonade is relied on; it converts any of the metal accidentally swallowed into a sulphate.

LITHARGYRUM.—LITHARGE (PbO).—Is obtained by roasting lead in a current of air; it is described as occurring in pale brick-red scales; its hue varies, according to the rapidity with which it is cooled, from deep red to pale yellow; heated on charcoal, it fuses, gives off oxygen, and is easily reduced; sp. gr. 9·4.

PURITY.—If free from chalk, it dissolves without effervescing in nitric acid, diluted with six volumes of water; the solution, supersaturated with ammonia, and filtered, should have no blue colour, if containing no traces of copper.

USES.—For preparing litharge plaster and some lead salts; occasionally sprinkled in powder over excoriations, ulcers, and burns, as an astringent; by becoming absorbed, it may cause dangerous symptoms.

EMPLASTRUM LITHARGYRI. — LITHARGE PLASTER.— Well known as diachylon, serves as the basis for most medicinal plasters; by ether it separates into soluble oleate and insoluble stearate of lead; if heated, it melts, and decomposes with increased temperature, giving off inflammable gases, and leaving a charred residue, from which metallic lead can be obtained.

PREPARATION.—Boil gently in a copper pan, over a clear fire, litharge in very fine powder, lb. iv.; olive oil, one gallon; water, Oiijss., constantly simmering for four or five hours, and stirring until the oil and litharge acquire a proper consistence for a plaster, adding more water during the process, if necessary.

The olein and stearine of the oil decompose, their fatty acids forming the plaster with litharge, glycerine being set free; as this contains some dissolved oxide of lead, Price's glycerine is preferred for medical purposes. The water moderates the heat, and favours the reaction, supplying basic water to the fatty acids.

PLUMBI IODIDUM.—IODIDE OF LEAD (PbI).—Is not officinal; it is a bright yellow powder, without smell or taste; soluble in boiling water, and again falling in golden scales as the solution cools; given internally, its effects resemble those of other lead salts, as the acetate; applied in ointment, composed of sixty grains of the iodide, to lard, ℥j., it is used to absorb strumous and syphilitic glandular swellings, and for dressing lupoid ulcers.

PREPARED—By saturating nitrate of lead dissolved in water, with iodide of potassium, and collecting the precipitate.

PLUMBI CARBONAS.—CARBONATE OF LEAD ($2.PbO,CO_2 + HO,PbO$).—White lead, or ceruse, is always got artificially for medical use, by passing carbonic acid into vessels containing litharge, moistened with acetic acid; or by exposing sheet lead to the fumes of vinegar, in earthen vessels surrounded with tan, which decays, and supplies carbonic acid. If obtained by precipitating soluble lead salts with carbonate of soda, it is deficient in opacity and colour.

PURITY.—The absence of chalk is shown by dissolving in acetic acid, treating with sulphuretted hydrogen, and boiling, and filtering off the sulphide of lead; the clear fluid should not precipitate with oxalate of ammonia. The most common adulterations are sulphates of barytes and lime, both insoluble in acetic acid, in which carbonate of lead perfectly dissolves.

EFFECTS.—Mixed with three or four parts of starch, it is used to dry up excoriated and ulcerated surfaces, burns, and eczematous eruptions; this is one of the most active of the lead salts, and liable to become absorbed, causing dangerous symptoms.

UNGUENTUM PLUMBI CARBONATIS.—OINTMENT OF CARBONATE OF LEAD.—A useful application to inflamed piles, and for prolapse of the rectum; also for ulcers, blisters, and excoriations, to check excessive secretion.

Preparation.—The carbonate in fine powder, 64 grains; simple ointment, ʒi. Mix.

PLUMBI ACETAS. — Acetate of Lead ($PbO, C_4H_3O_3 + 3HO$).—The acetate or sugar of lead forms brilliant crystals, which are modified rhombic prisms, with dihedral summits, usually sold in interlaced white masses, resembling loaf-sugar; in dry air it effloresces slightly, has an acetous odour, and, absorbing carbonic acid, forms some insoluble carbonate of lead; its taste is sweet, astringent, and metallic; it dissolves in two parts of water, the solution reddening litmus. Heated to 136°, it gives off its water; a stronger heat evolves carbonic acid and acetone, and if prolonged yields metallic lead.

Preparation.—To acetic acid, Oij.; distilled water, Oj., mixed; add litharge in fine powder, ʒxxiv.; dissolve with gentle heat; filter; evaporate till a pellicle forms, and set aside to crystallize; drain, and dry the crystals on filtering paper without heat.

In this process direct union occurs between the acid and litharge. The salt is difficult to crystallize, and always obtained from large manufacturers.

Purity.—Dissolved in distilled water, its solution is clear, or only slightly turbid from traces of carbonate, clearing with acetic acid; thirty-eight grains, melted in water, require for complete precipitation twenty measures of the volumetric solution of oxalic acid.

Effects.—A single large dose, such as ʒss., or upwards, will usually cause serious symptoms, unless soon vomited; a metallic persistent taste is complained of, speedily followed by severe pain in the epigastrium, colic, prostration of strength, and coldness of the limbs or cramps; comatose or convulsive attacks, and paralysis, have resulted from its use, though it can hardly be considered an active poison. Repeated small doses more frequently induce dangerous effects; hence, in prescribing, we require to watch its administration, suspending it so soon as the distinctive blue line appears on the gums, or colic is induced. Much larger quantities can be given with safety than is often supposed—as five to ten grains, or upwards, twice or thrice daily, for three or four days; though some susceptible individuals are affected by comparatively small doses;. thus I have seen six grains, used in divided portions, cause slight colic, and blue marks round the teeth.

Acetate of lead is an invaluable astringent for chronic forms of diarrhœa, not attended with pain or fever; and the latter stages of dysentery; it is particularly useful in checking the purging of advanced phthisis, and for autumnal bilious diarrhœa. Though it has proved of little service in attacks of epidemic cholera, it checks the painless fluxes that prevail at the same time, and often precede the perfect development of that malady; some rely on it for relieving infantile cholera; it appears best suited for the exhausting purging that is liable to follow such attacks, and gradually wears out the strength. Another special use of acetate of lead is to arrest hæmorrhage, particularly from the lungs, stomach, and intestines; its powers are less decided over uterine flooding; in tropical fevers it is given to allay vomiting and irritability of the stomach, and in yellow fever, to prevent gastric hæmorrhage and black vomit; its astringence has also led to its employment for the hectic sweating of phthisis, and in certain cases of excessive bronchial expectoration. M. Brachet recommends it in grain doses, night and morning, to relieve mercurial salivation—a practice little followed; nor can its alleged influence in diminishing the size of aneurismal tumors or enlargements of the heart be relied on.

Externally, it is applied in lotions to recent sprains and superficial inflammations, and to check the secretion from excoriated or burned surfaces; as an injection for gonorrhœal discharges in females; and a collyrium in cases of ophthalmia; when ulcers exist on the cornea or conjunctiva, Dr. Jacob has pointed out the danger there is of indelible white stains being caused by the use of lead solutions.

Dose.—One or two grains, generally given combined with opium, in pill or solution; it can be repeated every two or three hours; or, in some instances, larger doses, as gr. x., are safely used twice or thrice daily; if ordered in mixture, acetic acid is added, to dissolve the salt, and render the solution more palatable. The meconate of morphia contained in opium will form a small portion of meconate of lead, and acetate of morphia, an unimportant change so far as treatment is concerned. All vegetable solutions containing tannin, sulphuric acid, and hard waters, decompose acetate of lead, and are incompatible with it.

For lotions, sixty grains to a quarter of an ounce are added to distilled water, Oj., with a little acetic acid, which secures its solubility; in collyria, one or two grains suffice for f℥j. of water.

PILULA PLUMBI CUM OPIO.—Pill of Lead and Opium.—Acetate of lead is better suited for extemporaneous use than for an unvarying formula.

Dose.—Four to eight grains, three or four times in the day.

Preparation.—Acetate of lead, in fine powder, 36 grains; opium, in fine powder, 6 grains; confection of roses, 6 grains. Mix.

LIQUOR PLUMBI SUBACETATIS.—Solution of Subacetate of Lead (2 PbO, $C_4H_3O_3$, dissolved in water).—Usually termed Goulard's extract, from M. Goulard, who brought it into use about 1770; it is a colourless liquid, reacting alkaline; of sweet astringent taste; sp. gr. 1·26; if exposed to air, it becomes turbid; and forms a white opaque jelly with mucilage of gum arabic, which distinguishes it from a solution of the acetate.

Preparation.—Acetate of lead, ℥v.; litharge, in powder, ℥iijss.; distilled water, Oj.; boil for half an hour, constantly stirring; filter, and when cold add distilled water to make f℥xx.; keep the solution in stoppered bottles.

Adulterations.—If of full strength, fʒij. require for perfect precipitation twenty-seven measures of the volumetric solution of oxalic acid; when made with malt vinegar, it has a brown colour.

Uses.—Never prescribed internally; in large doses, this solution causes all the dangerous effects of lead; it is employed to prepare the dilute solution, and ointment; added to glycerine, it forms a useful remedy for excoriated and discharging surfaces, and effectually relieves the irritation of urticaria.

LIQUOR PLUMBI SUBACETATIS DILUTUS.—Dilute Solution of Subacetate of Lead.—Known as vegeto water, or Goulard's lotion; it should be colourless; if prepared with ordinary water, a milky deposit results from the salts, sulphates, chlorides, and carbonates present in the water.

Preparation.—Solution of subacetate of lead, fʒij.; rectified spirit, fʒij.; distilled water, f℥xixss. Mix, and filter for use.

Effects.—Applied in lotion to sprains, for recent injuries, excoriated parts, and superficial burns; and often formed into a poultice with bread crumb.

UNGUENTUM PLUMBI SUBACETATIS.—Ointment of Subacetate of Lead.—Used to dress ulcerated surfaces, excoriations, or blistered parts when inflamed and suppurating, and to relieve painful hæmorrhoids.

Preparation.—Melt in a steam or water bath, white wax, ℥viij.; olive oil, f℥xvj.; remove the vessel, and, as the mixture thickens, add solution of subacetate of lead, f℥vj.; stir constantly till cool; then add camphor, gr. viij., dissolved in olive oil, f℥iv., and mix thoroughly.

MANGANESE (Mn).—A greyish-white, hard, but brittle metal; difficult to fuse, and soon oxidizing if exposed to air; it is obtained by intensely heating the carbonate, made into a paste with oil and sugar, for a couple of hours in a forge; it forms several oxides, of which the black oxide, MnO_2, and permanganic acid, Mn_2O_7, are used in pharmacy.

Tests.—Its solutions throw down a pink sulphide with hydrosulphuret of ammonia, soluble in acetic acid; compounds of manganese, heated on platinum wire before the blowpipe, with a bead of soda and a little nitre, give the green manganate of soda, which, dissolved in water, changes to a pink solution on adding an acid.

BLACK OXIDE OF MANGANESE (MnO_2).—Is got native; when the ore is pure and crystalline, it is termed PYROLUSITE; with water it forms wad, an earthy amorphous substance. It is sold in powder of deep black colour, without taste or smell, insoluble, and almost infusible; if heated, it affords oxygen; it should dissolve in hydrochloric acid, evolving chlorine; it is also added to the ley for preparing iodine, and enters into the making of corrosive sublimate.

IMPURITIES.—It may contain variable quantities of sulphate of barytes, earthy matters, and oxide of iron; its great value in commerce renders it necessary to determine their amount, which is calculated from the bulk of oxygen or chlorine that a given weight of the powder is capable of forming.

MERCURY (Hg).—Quicksilver, is the only metal that is fluid at ordinary temperatures; it is brilliant, resembling silver in lustre; it boils at about 660°, forming dense colourless vapours; evaporates slowly in the air, and, if heated with water to 150°, gives off an appreciable quantity of mercurial fumes; at $-40°$ it freezes into a crystalline malleable solid; and when pure, does not tarnish on exposure to the atmosphere. Its chief ores are the sulphide or cinnabar, and native mercury, from which it is got by heating with iron or lime to separate the sulphur, and conveying the mercurial vapour into a room, where it condenses. It forms two series of salts, corresponding to the oxides, Hg_2O, and HgO.

TESTS.—The soluble SUBSALTS produce with iodide of potassium a greenish subiodide; with potash or lime water, the black suboxide; and heated with chloride of tin, yield metallic mercury.

The soluble SALTS with iodide of potassium give a scarlet iodide, redissolved in excess, forming a clear solution; with lime or potash water, the yellow hydrated oxide; with ammonia, a white precipitate; and if boiled with chloride of tin, deposit mercury.

Both salts are blackened by sulphuretted hydrogen; and when heated with dry carbonate of soda in a glass tube, afford a sublimate of mercury in minute globules, which cohere if touched with a rod.

EFFECTS.—Metallic mercury was formerly used as a mechanical means of removing obstructions in the bowels; it is highly objectionable when organic lesions or intussusceptions exist; and is liable, if retained for any length of time, to excite profuse and dangerous salivation.

When absorbed or inhaled in vapour by looking-glass makers, gilders, and others, it produces a remarkable train of nervous symptoms, termed *tremblement metallique*, or mercurial palsy. This commences in a tremulous state of the muscles of the arm, which increases until it becomes almost convulsive; if the patient is spoken to, or agitated, the limbs are thrown into spasms, the voice is stammering and impeded, and every muscle appears to quiver; in some instances, after repeated attacks, vertigo, loss of memory, and cerebral disease, are liable to occur. To cure the affection, the occupation must be relinquished, and fresh air, good diet, and tonics employed; chalybeates are specially recommended; and Melsens has proposed the internal use of iodide of potassium in this and similar cases of chronic metallic poisoning, to eliminate the metal from the system. Prof. Christison is disposed to consider it easily but slowly curable.

The local effects of those preparations of mercury which are used topically will be best considered under their proper headings. Some salts, as the chloride and acid nitrate, act as energetic caustics, and all mercurials applied externally are liable to become absorbed, and produce constitutional symptoms. Mercurials, when employed internally in small repeated doses, have an alterative action, and cause increased glandular secretion; the bile, intestinal discharges, and saliva are augmented; the pulmonary and cutaneous exhalations are less evidently affected; but the urine is passed in greater quantity, and the absorption of morbid serous effusions, and of the products of inflammation, rapidly progresses, as we observe in pleuritis, peritonitis, and pneumonia. When exhibited for some time in this manner, at intervals of a few hours, it usually produces about the second day griping pains and looseness of the bowels; towards evening, the gums feel swollen and tender; the breath has a peculiar odour, and a slight metallic taste is complained of; on the third or fourth day the discharge of saliva is considerably increased; salivation may happen on the second day, if mercury is prescribed at short intervals, or in large doses; but I have as yet seen no instance in which it appeared under twenty-four hours, and it seldom takes place so soon. In practice, it is rarely necessary to push mercury beyond the stage of inducing slight soreness of the gums, and metallic taste; hypersalivation must always be considered uncalled for; it is attended with decided febrile exacerbation, and swelling of the parotid and sublingual glands; the tongue, at first moist, and covered with a white creamy fur, becomes indented on its edges by the teeth, and in severe cases greatly enlarged and ulcerated; loss of the teeth, which loosen in their sockets, necrosis of the alveoli, adhesions of the soft parts within the mouth, and permanent injury to the health, have all resulted from the careless or injudicious use of this potent mineral.

There is a peculiar idiosyncracy in some individuals, who are violently affected by minute doses of mercury—a grain of calomel, or one or two of blue pill, being sufficient to excite profuse salivation; it is not common, and in most instances which I have observed it has occurred in delicate females, of fair and florid complexion. It is remarkable that children under ten years of age are seldom salivated; they tolerate comparatively larger doses of mercurials than adults, and in them its full constitutional effects are denoted by the alvine evacuations, which are compared to chopped spinach. Cancrum oris, or noma, is asserted to result from salivating infants; it sometimes prevails epidemically; and is not uncommon in badly-fed children, or after eruptive febrile diseases, as measles; in the great majority of those attacked, there is no reason for attributing it to mercury, for they have never taken the least quantity; in one instance alone have I seen anything approaching to sloughing produced by mercurials; still charges of malpractice are liable to be made, and it is well to abstain as far as possible from employing them with delicate children, in whom at the best they are fully liable to do more harm than good; the odour of salivation and the swelling of the gums are said to distinguish between these affections; they cannot be relied on as diagnostic marks. In recently-born syphilitic infants, if mercury is administered to the mother, and the infant continues to be suckled, violent and fatal diarrhœa and vomiting are not unusual, or a rapidly spreading gangrene of the limbs may result.

There are few drugs that have more ills laid to their charge; and, admitting that few are more liable to be improperly used, and that, like all energetic medicines, mercury is capable, under such circumstances, of doing serious mischief, yet a great number of its alleged evils are without foundation, and others at least exaggerated. One of its effects is a febrile state of the system, with headach, quick pulse, and restlessness, that precedes the establishment of salivation, and subsides on stopping the mercurial, and giving saline purgatives. Several cutaneous diseases have been attributed to it; the only eruption which it undoubtedly causes is a form of eczema; this may be produced locally by applying mercurial ointment to a tender skin, and is not likely to spread unless neglected; when it originates in the internal use of mercurials, it will at times extend over the entire body; the surface becomes scarlet or dull red; vesicles rapidly form, filled with yellowish serum, which, bursting, exude a thick, honey-like, fœtid fluid, drying into crusts; the symptoms are heat and itching of the skin, febrile disturbance, and, in severe cases, oppression of the breathing; the eruption runs an acute course, and on recovery the cuticle desquamates in large patches; a fatal termination is fortunately seldom witnessed, it is said to be accompanied by low typhoid fever.

The nervous affection termed mercurial erethysm, described by Mr. Pearson, is amongst the most dangerous and serious of its effects, though fortunately not often witnessed; it is characterized by great depression of strength; an anxious feeling about the heart; a small, rapid, and sometimes intermittent pulse; pale countenance; sighing, trembling, and a sense of chilliness; but the tongue is seldom furred, nor have I ever seen any signs of mercurial salivation; the chief thing to be dreaded is sudden syncope, which may occur on slight exertion. It is best treated by discontinuing the mercury, exhibiting small doses of opium, with ammonia and stimulants, insisting on perfect rest, and, above all, admitting fresh air freely night and day.

Iritis, swelling of the testicle, sore throat, phagedena, periostitis, —all the secondary effects of syphilis—have been most unfairly ascribed to mercury. Syphilis is quite competent to cause such affections, where not one grain of this metal is employed; and it is unjust to attribute to the treatment what results from the disease, possibly in a broken-down constitution; it is quite another question how it should be treated under such circumstances.

That mercury becomes absorbed is proved by its being detected in the blood and urine; and there are a few authentic cases in which the metal has been got within the bones; if long continued, it will deteriorate the blood, and destroy the red globules, blanching the complexion; but when judiciously given, it is not unusual for a patient to gain flesh considerably during its employment. In recent inflammatory affections, the administration of mercury checks the deposition of coagulable lymph, and favours its reabsorption; thus, in a case of syphilitic iritis of one eye recently attacked, in which the other eye was useless from a contracted and adhering pupil, for upwards of a year previously, its administration not only arrested the acute disease in the eye, but removed the old adhesions, and perfectly restored the vision. With this object of absorbing lymph, it is prescribed in pneumonia, pleuritis, peritonitis, croup, and meningitis,—local bloodletting, by cups or leeches, being often used at the same time, to control the diseased action, and blisters at a more advanced stage, to act as derivatives and counter-irritants. In low forms of pneumonia, mercury is of little service; tonic treatment, support, and full doses of quinia, are far preferable; the same holds good in all asthenic affections where the effused material is aplastic or of low adhesive character, and it is positively injurious when purulent secretion has taken place to any extent. Some are disposed to consider pneumonia in the aspect of a continued fever, requiring to run a certain but unlimited course, and tending to ultimate recovery, provided the patient's strength is properly kept up; whilst others insist that in it and all sthenic inflammations, the lymph will become re-absorbed after a time, in healthy states of the system, without the smallest aid from mercury; allowing that a proportion of cases can recover with little or no treatment, and that others require the liberal use of nourishment, stimulants, and tonics, still there will remain a class of intermediate nature which it is difficult to believe will not be influenced for good by the judicious exhibition of a powerful absorbent and alterative remedy like mercury.

For affections of the mucous membranes, attended with serous discharges, as bronchitis and diarrhœa, mercurials are seldom employed; they are, however, useful in the second stage of acute bronchitis, when the smaller tubes are affected, and the breathing much oppressed, the expectoration being scanty and viscid; and can be advantageously combined with expectorants, as ipecacuanha, or squill, a treatment best suited for those cases where antimonials are contra-indicated. In recent dysenteric attacks, mercury is found in general to act most favourably, the tenesmus and other symptoms yielding so soon as the mineral is pushed sufficiently to affect the gums. For croup, when lymph begins to be thrown out, and in œdema of the glottis, the alternate exhibition of calomel and nauseating doses of tartar emetic are our best resource; in the latter case, if the œdema is considerable, a small incision of the swollen and prominent epiglottis will assist in discharging serum, and perhaps obviate the necessity for tracheotomy.

Mercury should never be given, unless in exceptional instances, to persons affected with granular or fatty degeneration of the kidneys, in whom the smallest doses are liable to excite profuse and dangerous salivation. For cardiac dropsy, depending on contracted mitral valve, calomel or blue pill, with digitalis, and diuretics, are of essential service in regulating the heart's action, removing the dropsical effusion, and increasing the quantity of urine.

Acute rheumatism is treated by some practitioners with mercurials, and I have seen it thus rapidly relieved, the improvement being decided and encouraging; but it proved either transient, or was followed by distressing neuralgic attacks and recurring rheumatic diseases of different organs, lasting for several months, and requiring considerable trouble to overcome them.

The constitutional treatment of syphilis is still a subject of controversy; it was formerly considered indispensable for the healing of every description of syphilitic sore to induce free salivation; the extreme reaction against this view led to a non-mercurial mode of treating all venereal affections; its advocates claim that by not giving mercury for primary sores, secondary symptoms are less frequent, and milder, and that the distressing cases of constitutional syphilis which they attribute to the combined effects of mercurials and venereal poison are never observed; there are serious objections to the use of mercury in persons of broken-down constitutions or dissipated habits, in strumous states of the system, and for repeated infections; it requires judicious management for those who are healthiest, and ought never to be given indiscriminately or in excess: thus hypersalivation is uncalled for, and it seldom is necessary to induce more than slight ptyalism and sponginess of the gums, preferring the mildest preparations—blue pill, mercury with chalk, or the green iodide; should the bowels become affected, and purging set in, it must be guarded by opiates, or used in the form of inunction. Although there can be no question that primary sores heal without mercury, they will improve more rapidly with its assistance, and with far less tendency to subsequent symptoms; nor does a non-mercurial practice secure mild secondaries, for I have seen severe rupic eruptions and soft nodes ensue where not a grain of it had been taken. Mercury is peculiarly serviceable for healing those primary ulcers attended with induration; during its use, the patient should, as far as possible, be restricted to the house, and all febrile symptoms removed before commencing our treatment; in phagedena it is often asserted to be inadmissible: if given with caution, in well-selected cases, it proves of the utmost value, and rapidly arrests the phagedenic action.

For secondary eruptions, after the febrile disturbance which accompanies their appearance is subdued by appropriate means, healthy individuals are most safely treated with a regulated alterative course of mercury; whilst in cachectic states of the system it becomes necessary to improve the health previously in every possible way, by the use of tonics, the mineral acids, and the iodides of iron and potassium; in later tertiary symptoms, the practice that is adopted depends so much on the antecedent history, and the condition of the patient, that it is unnecessary to enter upon its details here. Two distinct indications are presented to guide us:—one, the advancement of the strength by dietetic and tonic treatment; the other, the specific action of mercury, so soon as the constitution admits of it.

In infantile syphilis, when infants are born dead and premature, the parents, if treated with a steady course of mercurials, will often have healthy offspring afterwards; and there are reasons for believing that, if administered during pregnancy to an infected mother, mercury will prevent miscarriage. If a child manifests symptoms of the disease after birth, it is better to wean it, and then steadily exhibit small doses of grey powder, or apply mercurial ointment to the limbs, inside of a flannel roller; this treatment requires to be continued for two or three weeks, and afterwards small doses of iodide of potassium can be employed for some time longer.

HYDRARGYRUM.—Mercury—Requires to be purified from accidental or intentional adulterations, particularly lead, tin, and zinc, to which bismuth is often added, as it forms a more soluble amalgam; it should not tarnish readily, and becomes perfectly dissipated by heating, if pure.

Preparation.—Place mercury of commerce, lb. iij., in a glass retort or iron bottle, and distil with heat, lb. ijss. of the metal into a flask; boil on this hydrochloric acid, f℥iij., diluted with distilled water, f℥ix., and having washed off every trace of acid by distilled water, place the mercury in a porcelain capsule, and dry it, first by filtering paper, and then on a water bath.

Distillation removes the mercury from all fixed impurities. The hydrochloric acid dissolves any traces of oxide that form.

HYDRARGYRUM CUM CRETA.—Mercury with Chalk.—Is termed grey powder, from its colour; it contains the metal minutely subdivided, and occasionally traces of grey oxide; when heated, the chalk is left as a white residue.

Preparation.—Rub in a porcelain mortar mercury, by weight ℥j.; chalk, ℥ij., until all globules cease to be visible.

Effects.—A mild mercurial, which, if properly made, should present no apparent metallic globules; the chalk renders it slightly antacid, and less liable to run off by the bowels; it is constantly prescribed when it becomes desirable to obtain the constitutional action of mercury in syphilitic or inflammatory affections; for children it is given to improve the secretions of the liver and intestines, and often added to purgatives; with rhubarb it checks those forms of diarrhœa which are attended with clay-coloured stools, and defective discharge of bile; and is much relied on in alterative doses for strumous diseases of the mesenteric glands; it is preferable to cinnabar for fumigations, as, when heated, it yields simple mercurial vapour, free from sulphurous acid.

Dose.—To affect the gums, two to five grains, thrice daily; should rapid action be desired, it is given every three or four hours; for children, two to three grains, added to purgatives; to fumigate, thirty to sixty grains; if prescribed in pills, they contract when long kept, and may force the particles of mercury into globules.

PILULA HYDRARGYRI.—Mercurial Pill.—Or blue pill, is prepared by steam power, the extinction of the metal being difficult and tedious; if well made, it presents no appearance of globules when rubbed on paper; it consists essentially of minutely divided mercury, with a small but variable proportion of suboxide; three grains are equivalent to one of mercury.

Preparation.—Mercury, ℥ij.; confection of roses, ℥iij.; rub until the globules disappear, and add liquorice root in fine powder, ℥j. Mix well together.

Adulterations.—It does not always contain its full proportion of mercury; and clay, coloured by Prussian blue, has been detected in it; should the conserve of roses have sulphuric acid added to brighten its colour, the dangerous subsulphate of mercury will be formed.

Effects.—In small repeated doses it acts as an alterative, and is prescribed with opium for inflammatory affections, &c., to produce the constitutional effects of mercury; combined with purgative pill masses, it stimulates the liver and intestinal glandular secretions, and is sometimes given a few hours before a senna draught, with the same intention; but of late, podophyllin is becoming advantageously substituted for mercurials in many instances; for children, blue pill may be dried and rubbed into powder, or suspended with mucilage in a mixture.

Dose.—To salivate, five grains, thrice daily, or three grains, taken every four hours; as an alterative, two to four grains, used once or twice in the day.

UNGUENTUM HYDRARGYRI.—Mercurial Ointment.—Is invariably made by large drug houses with the aid of steam; it is difficult to extinguish the metal, for which purpose several materials have been proposed in turn:—stearine, old mercurial ointment, and suet, which is now officinal; like blue pill, it consists of minutely divided mercury, with a variable proportion of suboxide; part of this combines with the fatty matter.

Preparation.—Mercury, lb. j.; prepared lard, lb. j.; prepared suet, ℥j. Mix till globules cease to be visible.

Adulterations.—It should contain nearly half its weight of mercury, but is often prepared with less, and colouring matters added to deepen its hue; the sp. gr. of good ointment is about 1·77; by ether or turpentine its fat can be removed, and the mercury weighed.

Effects.—This ointment is applied as a dressing to blistered surfaces, after removing the cuticle, to aid the absorption of chronic glandular swellings and non-malignant tumors; also with a view to salivate rapidly in inflammatory affections, as in acute meningitis to the scalp; over the heart, in pericarditis; the abdomen, in peritonitis; and to the joints, in synovitis; when the ointment is stale or rancid, it is liable to excite pain and irritation, requiring its removal, and the use of poultices. In frictions, it is rubbed to the unbroken skin—preferably along the spine, in the axillæ, or to the inner side of the thighs; the rubbing should be long continued, and, if possible, made by the patient himself, in a warm room, or, if by another, a leather glove worn to protect him from its effects; the residue of the ointment is usually allowed to remain until the gums begin to be affected; if it excites an eczematous eruption, it should at once be washed off; mercurial inunction is a favourite mode of treating syphilitic affections, and considered safer and better than giving mercury internally; camphor is sometimes added—it liquefies the ointment, and renders its absorption more rapid; some have employed mercurial ointment internally, mixed with liquorice powder; its effects are similar to those of blue pill, over which it has no advantage.

Dose.—To salivate, about sixty grains are rubbed inside the thighs, &c., every twenty-four hours, if possible using a fresh surface each time; after three or four rubbings the mouth will generally become affected; when a rapid action is desired, thirty grains may be applied every two or three hours, which will salivate in about thirty hours.

LINIMENTUM HYDRARGYRI.—Mercurial Liniment.—Contains about one-sixth its weight of mercury; it readily salivates, and acts as a local stimulant; it is applied with friction when rapid mercurial action is required for acute inflammations; also to disperse chronic tumors, and absorb collections of fluid.

Dose.—Thirty to sixty grains, rubbed in night and morning.

Preparation.—Mercurial ointment, ℥j.; liniment of camphor, f℥j; liquefy with gentle heat, and add solution of ammonia, f℥j., gradually, and mix.

EMPLASTRUM HYDRARGYRI.—Mercurial Plaster.—Is applied, spread on calico or leather, over glandular, strumous, and syphilitic swellings, for nodes, and as strapping in chronic diseases of the joints; it is liable to salivate those who are susceptible of mercurial action.

Preparation.—Melt resin, ℥j.; olive oil, f℥j.; when cool, add mercury, ℥iij.; triturate till the globules disappear; then add litharge plaster, ℥vj., previously liquefied, and mix thoroughly.

The resin and oil are intended to extinguish the mercury; it disappears sooner if rubbed with common turpentine.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO.—Ammoniac and Mercury Plaster.—Used in the same cases as mercurial plaster; it is more stimulant, and contains only two-thirds the quantity of mercury.

Preparation.—To olive oil, f℥j., heated gradually, add sulphur, gr. viij., stirring till they unite; with this triturate mercury, ℥iij., until globules are no longer visible; lastly, add ammoniac, ℥xij., previously liquefied, and mix carefully.

From the sulphuretted oil used to extinguish the mercury a small quantity of sulphuret of mercury results. It is necessary to add a little hot water to liquefy the ammoniac; then strain off any impurities, if required, and evaporate to a proper consistence. It does not fuse by simple heating.

HYDRARGYRI OXIDUM RUBRUM.—Red Oxide of Mercury (HgO).—The nitric oxide, or red precipitate, is usually in brilliant orange-red crystalline scales, tasting caustic, and strongly metallic; heated, it blackens, and gives off oxygen and mercury; it dissolves in hydrochloric acid; and when caustic potash is added in excess to the solution, it causes a yellow precipitate of hydrated oxide of mercury.

Preparation.—Dissolve mercury, by weight, ℥iv., in nitric acid, f℥iij., diluted with distilled water, f℥ij.; evaporate to dryness, and triturate the dry salt with as much more mercury until the two are intimately blended; heat the mixture in a porcelain capsule, with repeated stirring, until acid vapours cease to be evolved, and when cool keep the product in a bottle.

Nitrate of mercury is first formed, $3\,Hg + 4\,NO_5 = NO_2 + 3\,HgO, NO_5$; by mixing this with an additional atom of mercury previous to heating, it is oxidized at the expense of the nitric acid, which would otherwise be lost, $HgO, NO_5 + Hg = 2\,HgO + NO_4$. The success of the process in practice depends on the manipulation. The salt, evaporated to dryness, is placed on an iron plate and gently heated at first, and afterwards more strongly, so long as acid, not white, vapour escapes, without stirring, until towards the end, when it is compressed and broken down.

Adulterations.—It is liable to contain some unchanged nitrate of mercury; heated in a test tube, this evolves nitrous fumes; red lead, if present, is left after sublimation.

Effects.—It is used to prepare the ointment, and in fine powder sprinkled over soft warts and exuberant granulations as a caustic; taken internally in quantity, it causes irritant symptoms; cramps, vomiting, diarrhœa, and salivation have resulted from it, and death has ensued within forty-eight hours; the stomach and intestines are inflamed and eroded in patches, and particles of the poison seen adhering to them; in these cases, which are of rare occurrence, as there is no antidote, vomiting should be promoted, and mucilaginous substances given, to suspend the heavy red precipitate.

UNGUENTUM HYDRARGYI OXIDI RUBRI.—Ointment of Red Oxide of Mercury.—Used undiluted to stimulate chronic ulcers and suppurating sores; and applied in chronic conjunctivitis and tarsal ophthalmia, mixed with two to eight parts of cerate; the red oxide should be well levigated, as its grains produce small eschars; by keeping the ointment loses its colour, becoming grey.

Preparation.—The red oxide, in very fine powder, gr. lxiv.; simple ointment, ℥j. Mix.

CALOMELAS.—Calomel (Hg_2Cl).—The subchloride of mercury is a dull white, heavy, and impalpable powder, tasteless and odourless; insoluble in water, spirit, or ether; sp. gr. 7·14; it vaporizes at a heat below redness, and can be procured in modified four-sided prisms; digested in potash it becomes black, precipitating the suboxide.

Preparation.—Sulphate of mercury, ℥x.; moisten with boiling distilled water; add mercury, ℥vij. by weight, and rub until globules are no longer visible; then add dried chloride of sodium, ℥v., and mix thoroughly; sublime by a suitable apparatus into a chamber of such size that the calomel, instead of adhering to its sides as a crystalline crust, shall fall in fine powder on the floor; wash it with boiling distilled water until the washings cease to be darkened by a drop of hydrosulphuret of ammonia; lastly, dry it at a heat not above 212°, and preserve in bottles impervious to light.

Sulphate of mercury, mercury, and salt heated together produce sulphate of soda and subchloride of mercury, $HgO, SO_3 + Hg + NaCl = NaO, SO_3 + Hg_2Cl$. By subliming the calomel into a large room it is obtained in minute subdivision, and washed afterwards to remove any accidental traces of corrosive sublimate.

The buff-coloured calomel of commerce is sublimed into a large bolthead, afterwards carefully eleutriated in a quantity of water, and the finer particles ground, whilst moist, between French burr stones.

Adulterations.—Heavy white powders, as chalk, carbonate of lead, and sulphate of barytes, have been fraudulently added; they are left on vaporizing calomel by heat; traces of corrosive sublimate are a dangerous impurity; this salt is detected by agitation with ether, which dissolves it, and on evaporating it remains as a residue.

Effects.—Excessive doses do not always prove fatal; a healthy girl has taken an ounce of calomel in mistake, and, though retained for two hours before being expelled by emetics, it caused no serious consequences beyond griping and soreness of the abdomen; much smaller quantities have destroyed life; thus, possibly owing to some idiosyncracy of constitution, a boy has died within three weeks from using only six grains, and Professor Taylor mentions an instance of fatal salivation in an adult caused by five grains. In warm climates it is not uncommon to employ twenty to thirty grains, or more, every few hours, for acute dysentery, epidemic cholera, and yellow fever; it is considered to act as a sedative, relieving vomiting and diarrhœa, and I have known severe vomiting promptly checked by a single thirty-grain dose.

Calomel is seldom given as a purgative unless combined with other remedies—rhubarb, jalap, or the cathartic pill masses; it increases their activity by stimulating the hepatic and intestinal glandular secretions, and is therefore prescribed in jaundice, with torpor of the liver, for habitual or occasional constipation, and in those affections which require hard purging—cerebral inflammations, hydrocephalus, meningitis, &c.; it is alleged to act as a vermifuge for the oxyurus, or thread worm, but appears merely to expel the mucus and accumulated sordes in which they become developed, thus indirectly aiding their removal.

In chronic cutaneous eruptions, old syphilitic diseases, and hepatic or glandular enlargements, it is given in small repeated quantities as an alterative, often combined with antimonials,—a favourite formula being the well-known Plummer's pill; when used to induce salivation, its tendency to act upon the bowels is restrained by the addition of opium; and in cases where this is likely to prove injurious, James's or antimonial powder are frequently employed instead of opiates—a practice strongly advised for phrenitis, and other head affections; whilst exhibiting calomel, or any mercurial, acids ought to be avoided, being liable to cause griping; and some assert that common salt has a tendency to convert calomel into chloride of mercury, but this statement requires further proof.

Dr. Stokes, in treating pericarditis, recommends calomel, given after the manner that Dr. Johnson so strongly advocated for tropical diseases, that is, in doses of ten to twenty grains, once or twice in the day; the patient must avoid cold drink, acids, and fruits, and is permitted to drink freely of barley water; by this means, he observes, "it is found that mercurialization may be effected without producing any considerable amount of abdominal distress, and it is remarkable that the action of the medicine is attended with an abatement of fever, and a decided diminution in the frequency of the pulse."

Antidotes.—None known; emetics should be given, and mucilaginous fluids.

Dose.—For alterative purposes, half a grain to two grains, every night, or every second night; to salivate, two to five grains, thrice daily; a quarter of a grain to a grain, given every two hours, will rapidly affect the system; as a purgative, two to six grains, combined with other remedies.

PILULA CALOMELANOS COMPOSITA.—Compound Calomel Pill.—Or Plummer's pill, used as a valuable alterative in chronic rheumatism, syphilitic eruptions, and other secondary symptoms, and for cutaneous affections, as psoriasis and eczema, particularly when accompanied with syphilitic taint.

Dose.—Three to ten grains, at bed-time, or more frequently.

Preparation.—Calomel, ʒj.; sulphuretted antimony, ʒj. Mix, and add powdered guaiac resin, ʒij.; castor oil, ʒj.; rub well together.

UNGUENTUM CALOMELANOS.—Calomel Ointment.—A serviceable application in cutaneous eruptions, used in chronic eczema to allay itching; for impetigo; and the scaly affections, as psoriasis. It is rubbed over the indurations of acne to disperse the tumors, and similarly applied in aggravated attacks of sycosis.

Preparation.—Calomel, gr. lxxx.; prepared lard, ʒj. Mix.

HYDRARGYRUM CORROSIVUM SUBLIMATUM.—Chloride of Mercury ($HgCl$).—Or corrosive sublimate, is met in small needle-shaped crystals if sublimed with moderate heat, or heavy semi-transparent colourless crystallized masses when strongly heated and fused; its taste is acrid, persistent, and metallic; sp. gr. 5·4; it fuses at 509°; boils and sublimes at 563°, forming an acrid, poisonous vapour. It dissolves in eighteen parts of cold water, or three of alcohol; and freely melts in ether, which will remove it from an aqueous solution, or from mixtures containing organic matters; its solubility is increased by adding hydrochloric acid, or sal ammoniac, as they produce double salts; that with sal ammoniac has been long known as sal alembroth. Its solution in water, if exposed to light, will gradually decompose, depositing calomel; the crystals got by subliming are square octohedrons; those from evaporation are quadrilateral prisms, being dimorphous.

Preparation.—Mix thoroughly sulphate of mercury, ʒxx; dried chloride of sodium, ʒx.; black oxide of manganese, ʒj., all in fine powder; place in a tall matrass of green glass, and by a regulated heat applied through the intervention of sand, let the corrosive sublimate be sublimed; break the matrass, remove the sublimate, and preserve it in bottles impervious to light.

The reaction consists essentially in an interchange of elements between sulphate of mercury and chloride of sodium, $HgO, SO_3 + NaCl = HgCl$

+ NaO, SO_3. Black oxide of manganese prevents the reduction of the sulphate of mercury to subsulphate, and favours the escape of chlorine from the common salt.

TESTS.—Its solution, when dropped on gold, is decomposed if touched with bright iron, depositing metallic mercury. It is similarly deposited on bright copper by a zinc rod. (See the SALTS OF MERCURY for other reactions.)

ADULTERATIONS.—Sal ammoniac has been detected in it; its purity is tested by its solubility in ether; when heated, it sublimes without decomposing.

EFFECTS—In cases of malignant onychia, it is occasionally used, mixed with an equal quantity of sulphate of zinc, and sprinkled over the ulcer to destroy the diseased surface; this practice is not free from risk; it may cause excessive pain and tumefaction, or the mercury, by becoming absorbed, may induce poisonous symptoms. Weak solutions of gr. ss. to gr. j. in the ounce of fluid are applied to remove freckles and slight forms of acne; as a collyrium in the ophthalmia of infants, and for purulent catarrhal ophthalmia, particularly useful for washing out the discharge before dropping in solution of nitrate of silver; also as a urethral injection in chronic gleet, and by some practitioners advised in gargles for syphilitic ulceration of the mouth and throat. Stronger washes are applied to induce local irritation over limited surfaces in cutaneous diseases, as herpes tonsurans, and chronic circumscribed eczema.

Taken in quantities of three to five grains, or upwards, it is a violent corrosive poison, causing intense metallic taste, burning heat, and constriction of the throat, extending along the œsophagus; soon followed by gastric pain and tenderness, distressing vomiting of stringy mucus and blood, and severe dysenteric purging; the countenance becomes either pallid and haggard, or flushed; there is extreme anxiety and restlessness; a feeble, rapid pulse; cold sweats; thirst, and subsequent collapse; or convulsions, stupor, and a condition of absolute coma, may precede death, which has likewise in some instances resulted from extensive mortification of the bowels. A fatal termination is recorded to have occurred within three hours; the average period varies from one to three days; and should the patient survive the primary effects of the poison, profuse salivation and ulceration of the mouth are to be looked for. The mercury unites with the tissues, rendering the mucous membrane white, grey, or slate-coloured, and patches of intense vascularity are found both in the stomach and intestines.

In repeated medical doses, it is employed as a valued and powerful alterative, particularly useful, dissolved in tincture or decoction of bark, for strumous and strumo-syphilitic affections, chronic glandular enlargements, strumous ophthalmia, &c. This combination is also of service in treating several obstinate eruptions, as eczema, occupying the extremities in females about the change of life, or in middle-aged men, and impetigo or eczema of the scalp of long duration;

it appears best suited for those rashes with serous or sero-purulent exudation, and is of less benefit in the scaly forms of disease.

The alterative influence of this salt renders it a favourite remedy in periosteal and rheumatic pains, so often associated with a venereal taint; and it occasionally affords decided relief in idiopathic neuralgias, tic doloroux, and sciatica. I have found it most effectual for removing the obstinate and recurring neuralgia that has followed the injudicious administration of mercurials during acute rheumatism, and for rheumatic iritis. It has long been given in syphilis, and alleged to cure every stage of the disease rapidly, without inducing salivation; at present it is chiefly relied on for late secondary and tertiary symptoms, more for the sake of its alterative properties than as a mercurial, associated with cinchona or sarsaparilla, or given in pill with antimonials, opium being added if it affects the bowels over-much.

Antidotes.—Raw eggs should be administered with as little delay as possible, the albumen of which forms an almost inert compound, consisting of about ten parts of mercury to ninety of albumen. This is stated to be soluble in excess of albumen, and should therefore be expelled by vomiting; one egg is considered sufficient for each grain of corrosive sublimate, but much more may be given. When eggs cannot be obtained, gluten from flour, or a mixture of flour and water are substituted. The stomach pump is injurious, lacerating the softened mucous membrane; if necessary, emetics, such as sulphate of zinc, are employed, and antiphlogistic treatment, to relieve the subsequent symptoms.

Dose.—One-sixteenth to one-sixth of a grain preferably given in solution, and after meals; larger doses are liable to derange the stomach and bowels.

SOLUTION OF CORROSIVE SUBLIMATE.—Is used as a test solution.

Preparation.—Of the salt, gr. c.; distilled water, f℥v. Dissolve, and keep the solution in a bottle impervious to light.

HYDRARGYRUM AMMONIATUM.—Ammoniated Mercury (NH_2Hg_2, Cl).—May be considered to resemble sal ammoniac in composition, with two atoms of mercury replacing two of hydrogen; Sir R. Kane prefers ranking it as a double salt, consisting of chloride and amide of mercury, $HgCl + Hg, NH_2$; it is a white, heavy powder, sometimes sold in cohering masses; insoluble in water, ether, or alcohol; tasting earthy, and afterwards metallic.

Preparation.—Corrosive sublimate, ℥iij.; distilled water, Oiij.; dissolve with the aid of moderate heat; add solution of ammonia, ℥iv., constantly stirring; collect the precipitate on a filter, and wash well with cold distilled water until the washings cease to precipitate when dropped into solution of nitrate of silver acidulated with nitric acid; lastly, dry the product at a heat not above 212°.

When chloride of mercury and ammonia are mixed, white precipitate results and muriate of ammonia, which dissolves, $2\,HgCl + 2\,NH_3 = NH_2Hg_2Cl + NH_4Cl$.

Tests.—Digested with caustic potash it evolves ammonia, and becomes pale yellow; boiled with chloride of tin, it yields metallic mercury.

Adulterations.—Chalk and sulphate of lime, which remain when heat is applied, as white precipitate volatilizes under redness, decomposing, and forming calomel, nitrogen, and ammonia.

Effects.—Not employed internally, being irritant and poisonous; it causes gastric pain, nausea, and purging. It is used for preparing the ointment.

Antidotes.—None known; mucilaginous fluids, melted butter, or albumen, should be given, to suspend the powder, and free vomiting promoted.

UNGUENTUM HYDRARGYRI AMMONIATI.—Ointment of Ammoniated Mercury.—A useful application in eczematous and impetiginous eruptions, sycosis, and other cutaneous affections.

Preparation.—White precipitate, gr. lxiv; simple ointment, ℥j. Mix.

HYDRARGYRI IODIDUM VIRIDE.—Green Iodide of Mercury (Hg_2I).—A dull green powder; sp. gr. 7·7; insoluble in water, and distinguished from the red iodide by not dissolving in alcohol, ether, or solution of common salt; if long kept in closed vessels, it alters to a yellowish compound, considered by Kane a sesqui-iodide, Hg_4I_3, or $2\,HgI + Hg_2I$; on exposure to light, it decomposes partially into mercury and red iodide; the same change occurs on heating it in a test tube, the iodide subliming of bright yellow colour, changing to red with friction.

Preparation.—Rub mercury, by weight ℥j.; iodine, 278 grains, in a porcelain mortar, occasionally moistening the mixture with a few drops of rectified spirit, and continue the trituration until metallic globules disappear, and the whole assumes a green colour; dry the product in a dark room on filtering paper by exposure to the air, and preserve in an opaque bottle.

Purity.—The red iodide is detected by its solubility in ether; a little aniline is also a delicate test, forming, if heated with persalts of mercury, the magenta dye; fixed impurities are left on heating nearly to redness. If altered in colour, this salt ought not to be employed internally, and it is preferable when freshly made.

Effects.—It acts as an alterative and mild mercurial, but requires to be well guarded with opium, being liable to gripe; it is asserted that if given with iodide of potassium, it becomes converted into red iodide, and causes dangerous symptoms; there is not much risk if they are employed at different times of the day. For scrofulous affections, syphilitic symptoms occurring in infants and delicate persons, and the different forms of strumo-syphilitic disease, it is given in small repeated doses, and effectually cures condylomata. In ointment it is applied with friction to disperse chronic inflammations, as pleuritic effusions, hepatic enlargement, and thickening of the peritoneum.

Dose.—One to two grains in pill, taken twice or thrice daily, for adults; one-sixth to one-half a grain for children. An ointment can be made by adding ten to sixty grains to simple cerate, ℥j.

HYDRARGYRI IODIDUM RUBRUM.—**Red Iodide of Mercury** (HgI).—A scarlet crystalline powder, sp. gr. 6·3, almost insoluble in water; sparingly dissolved in alcohol, and freely in ether, or by an aqueous solution of iodide of potassium; inodorous, and having a strong metallic taste; heated to 400°, it melts into a red liquid, and sublimes in yellow crystals, which become red after a time, or by friction with a hard substance, being dimorphous,—the yellow crystals forming right-rhombic prisms, and the red subliming in square octohedrons; if redissolved with excess of iodide of potassium, it yields a soluble double salt, HgI + KI.

Preparation.—Dissolve corrosive sublimate, ℥iv., in boiling distilled water, Oiij., and iodide of potassium, ℥v., in distilled water, Oj.; mix the solutions, and, when the temperature falls to that of the atmosphere, decant the supernatant liquid, and collect the precipitate on a filter; wash twice with cold distilled water, and dry at a heat not above 212°.

An interchange of elements occurs, forming iodide of mercury and chloride of potassium in solution, HgCl + KI = HgI + KCl.

Adulterations.—It is usually pure; it volatilizes completely with heat, and is soluble in ether, which detects any traces of the insoluble subiodide.

Effects.—The red iodide is a powerful irritant poison, resembling corrosive sublimate in its action; given internally in small doses, it is prescribed for strumo-syphilitic affections, lupus, and chronic venereal rheumatism; it is also dusted over lupoid ulcers to destroy the diseased parts, and excite healthy granulations; it causes severe pain and local inflammation for a few days, after which the sore improves.

Dose.—One-sixteenth to one-eighth of a grain, thrice daily; a useful mode of exhibiting it is dissolved in water with iodide of potassium, forming a colourless solution.

UNGUENTUM HYDRARGYRI IODIDI RUBRI.—**Ointment of Red Iodide of Mercury.**—Applied for dressing strumous, lupoid, and venereal ulcerations; it causes sharp local inflammation, followed by rapid improvement, and requires to be diluted with cerate for tender skins; in cutaneous diseases, as indurated acne, herpes circinatus, and limited eczematous rashes, a single application will often alter the diseased action, and promote healing.

Preparation.—The red iodide, in very fine powder, gr. xvj.; simple ointment, ℥j. Mix.

SULPHURET OF MERCURY (HgS).—Vermilion, or cinnabar, is not officinal; in fine powder, it is brilliant red, having no taste or odour; if massive, crystalline and dark reddish-brown; when heated, it volatilizes in closed vessels, taking fire in the air, and forming mercurial vapour and sulphurous acid. It is occasionally used to fumigate external ulcerations; for the throat it is most objectionable, as the sulphurous fumes are liable to excite cough and laryngeal irritation; the quantity employed varies from thirty to sixty grains.

SULPHATE OF MERCURY (HgO, SO_3).—A heavy, opaque, white salt, used to prepare calomel and corrosive sublimate; at a dull red heat it becomes orange-coloured; if heated further, it decomposes into mercury, oxygen, and sulphurous acid. Water separates it into a soluble acid salt, and the insoluble yellow basic subsulphate, $3\,HgO + SO_3$, termed Turpeth mineral. If pure, it is perfectly volatilized by heat.

Preparation.—Mercury, by weight, ℥xx.; sulphuric acid, f℥xij.; heat in a porcelain vessel until the metal disappears, and then continue the heat till a dry salt remains.

Mercury and sulphuric acid form sulphate of mercury and sulphurous acid, $2\,SO_3 + Hg = HgO, SO_3 + SO_2$.

LIQUOR HYDRARGYRI NITRATIS ACIDUS.—Acid Solution of Nitrate of Mercury (HgO, NO_5).—A colourless acid and caustic solution, having an intense acrid metallic taste; and changing the skin to a purplish hue when exposed to sunlight; sp. gr. 2·246; if evaporated, it evolves nitrous fumes, depositing crystals of $HgO; NO_5 + 2\,HO$, which are deliquescent, and decompose with water.

Preparation.—Mix in a flask nitric acid, three and a quarter fluid ounces; distilled water, f℥iij., and dissolve in it mercury, ℥iv., without heat; boil gently for fifteen minutes, cool, and preserve the solution in a stoppered bottle.

When mercury is acted on by nitric acid, binoxide of nitrogen escapes, and the metal becoming oxidized, unites with the rest of the acid, $3\,Hg + 4\,NO_5 = NO_2 + 3\,HgO, NO_5$.

Test.—The presence of nitric acid is shown by dropping a crystal of sulphate of iron into the solution; the crystal and surrounding liquid acquire a dark hue.

Purity.—To test the absence of lead and silver, add hydrochloric acid, diluted with two volumes of water; it should give no precipitate.

Effects.—An energetic caustic, requiring to be used with care; applied to phagedenic and lupoid ulcerations, and to check the spreading of syphilitic and scrofulous sores; it destroys the parts deeply which it touches, forming white eschars; an erysipelatous form of inflammation is liable to follow, and after a few days the hard scab falls off, leaving a healthy granulating surface behind; as there is danger of the mercury becoming absorbed, and salivating, it ought not to be applied over more than the extent of a crown piece at a time. If used for ulceration of the womb, for which it is strongly recommended by some authorities, special caution is necessary to prevent the caustic running down and injuring the vagina, causing erosion, and subsequent adhesions; the part intended to be cauterized should be carefully dried, and the nitrate pressed against the diseased surface on a moistened pledget of lint, or painted with a camel hair pencil, syringing afterwards with tepid water, or absorbing any excess of fluid before removing the speculum, on cotton wool; it is considered most suitable for extensive and unhealthy ulcers with fungous granulations, that bleed readily and resist milder remedies; should severe pain follow its employment, the local use of opiates and hip-baths may be needed; in some instances it has induced tenesmus and dysenteric symptoms, and, as already mentioned, may salivate; if, therefore, the ulcer is of large size, it is better to cauterize a portion at intervals, allowing a few days to intervene before repeating it.

I find that glycerine added to solution of acid nitrate of mercury reduces it after a time, depositing the metal, and is incompatible with it.

UNGUENTUM HYDRARGYRI NITRATIS. — **Ointment of Nitrate of Mercury.**—Citron ointment should be of fine yellow colour and soft consistence, having a peculiar nitrous odour; it is liable to become hard, brittle, and grey-coloured, from the escape of acid and the reduction of the mercury; it also decomposes if spread with iron spatulas; when hardened and discoloured, it can be restored to a proper state by remelting, and adding more nitric acid; it is always obtained of better quality by using large quantities, and following the pharmacopœial directions to secure the frothing of the mixture.

Preparation.—Dissolve mercury, ℥iv., in nitric acid, f℥viij., with the aid of gentle heat; melt prepared lard, ℥xv., in olive oil, f℥xxxij., by a steam or vapour bath, in a porcelain vessel capable of holding six times the quantity, and whilst hot add the solution of mercury, also hot, mixing thoroughly; if the mixture does not froth up, increase the heat till this occurs.

By dissolving mercury in nitric acid, nitrate of mercury forms; nitrous fumes escape, and the liquid contains nitrous and nitric acids; when added to the lard and oil, these acids convert them into elaidine, a white solid fat, and an orange-red oil, which gives the ointment its colour and smell; nitric oxide and carbonic acid escape, according to Soubeiran (Schacht only obtained nitric acid vapour, with the strong odour of the ointment), causing the frothing, and the mercurial salt becomes mechanically mixed through the mass.

Effects.—This ointment is irritant, and slightly caustic; for most purposes it bears dilution with four to six parts of cerate; it is applied to the eyelids, in psorophthalmia, to prevent their adhering, and improves the condition of the Meibomian glands; and is a useful remedy in different eruptions, as psoriasis, impetigo, acne, and mentagra; being particularly serviceable in eczematous diseases of the scalp.

PLATINUM (Pt).—Is procured in rolled masses or small grains, chiefly from South America and the Ural Mountains, mixed with the rare metals, palladium, rhodium, osmium, and iridium; it is white, of brilliant lustre, ductile and tenacious; fusing at high temperatures, as with the oxyhydrogen blowpipe, and can be welded similar to iron; its sp. gr. varies from 21 to 22, being the heaviest existing form of matter; from its insolubility in the strong acids, it is valuable for making chemical vessels, and platinum foil is constantly required in analytic research; in minute subdivision, termed PLATINUM BLACK, it absorbs and condenses large quantities of gases, particularly oxygen, and in this state it has the property of promoting several chemical changes, as the conversion of alcohol into acetic acid; it is got by boiling chloride of platinum with excess of solution of potash, and adding small quantities of alcohol until effervescence ceases; if exposed to a red heat, it aggregates into spongy platinum, which has similar properties, though less energetic.

Tests.—The persalts decompose by heat, leaving metallic platinum; with iodide of potassium they throw down a brown iodide of platinum; sulphuretted hydrogen forms a black precipitate, soluble in large excess of the alkaline sulphides.

SOLUTION OF BICHLORIDE OF PLATINUM ($PtCl_2$).—A deep orange-red solution, from which, by evaporation, the salt is got in deliquescent crystals, soluble in alcohol and ether; heated to 400°, it loses half the chlorine, and decomposes totally at a higher temperature. It is used to test potash and ammonia, forming insoluble double salts, $PtCl_2$, KCl, and $PtCl_2$, NH_4Cl; the reaction is promoted by using strong solutions, and adding some alcohol; the ammonia salt, heated to redness, leaves spongy platinum, from the weight of which its amount is calculated; the potash salt also decomposes, but affords a mixture of chloride of potassium and platinum.

Preparation.—Mix nitric acid, f℥ss.; hydrochloric acid, f℥iij.; distilled water, f℥ij.; pour into a small flask with platinum foil, one quarter ounce; digest at a gentle heat, adding more of the acids, mixed in the same proportion, if necessary, until the metal is dissolved; transfer the solution to a porcelain capsule; add hydrochloric acid, fʒj., and evaporate on a water bath till acid vapours cease to escape; dissolve the residue in distilled water, f℥v., and preserve in a stoppered bottle.

In this reaction chloronitrous acid escapes, bichloride of platinum resulting; the evaporation expels any excess of acid, $Pt + 3\,HCl + NO_5 = PtCl_2 + NO_2Cl + 3\,HO$.

SILVER (Ag).—A brilliant white metal, crystallizing in octohedrons, intermediate in hardness between gold and copper, and possessing considerable tenacity; it fuses at 1873°, and when melted, rapidly absorbs oxygen, which separates again as it cools; in the air it is not oxidized, but tarnishes and blackens from sulphur, decomposing the traces of sulphuretted hydrogen, commonly present in the atmosphere; for medical purposes refined silver is necessary, as it requires to be alloyed with copper when made into coin, to increase its hardness. It is found native, and in ores combined with gold, copper, or antimony, and in considerable quantity with sulphide of lead, from which it is extracted economically by Pattinson's process. The reduced metals are melted together; on slowly cooling, pure lead solidifies, and is removed by successive operations, leaving a residue containing all the silver dissolved in a small quantity of lead; to separate this, it is heated in a cupel of bone-ash in a reverberatory furnace; the oxidized lead sinks into the cupel or is blown aside by the hot blast, the pure silver shining brilliantly when the operation is completed.

Tests.—The soluble salts of silver, with chlorine or a chloride, form a curdy white precipitate of chloride of silver, blackened by sunlight; it is fusible into a corneous mass termed horn silver, and dissolves in ammonia; sulphuretted hydrogen yields a black sulphide; before the blowpipe its salts are readily reduced, if heated with carbonate of soda or charcoal.

Impurities.— Commercial silver contains copper and other metals; a solution of pure silver in nitric acid, with excess of ammonia added, should show neither change of colour nor turbidity.

Uses.—Silver is employed to prepare the nitrate; in leaf it is used to cover pills; and filings of silver amalgamated with mercury form an ordinary stuffing for carious teeth.

ARGENTI NITRAS.—**Nitrate of Silver** (AgO, NO_5.)—This salt, termed lunar caustic, is sold in rods about the thickness of a quill, and also crystallized in right-rhombic prisms; it remains unchanged by sunlight unless organic matters are present, when it blackens from partial reduction of the silver; its taste is bitter, unpleasant, and metallic; it dissolves freely in water, and is soluble in boiling alcohol, but on cooling the greater part of the nitrate deposits again; at 426° it fuses into a colourless liquid, and if exposed to light when melted, gradually acquires a yellow tint; at a red heat it decomposes, leaving a residue of metallic silver.

PREPARATION.—Nitric acid, 1¾ fluid ounces; distilled water, f℥v.; mix, and add to refined silver, ℥iij., in a flask, and apply gentle heat till the metal is dissolved; decant the clear fluid from any black powder that is present into a porcelain dish, and set aside to crystallize; pour off the liquor, and again evaporate and crystallize; drain the crystals in a glass funnel, and dry them in the air, carefully avoiding contact with all organic substances. To obtain the nitrate in rods, fuse the crystals in a dark room in a platinum or thin porcelain capsule, and pour the melted salt into proper moulds; preserve it in closely stoppered bottles.

Silver and nitric acid heated together give off binoxide of nitrogen, the silver oxidizing, and uniting with the rest of the acid, $3\,Ag + 4\,NO_5 = NO_2 + 3\,AgO, NO_5$. When nitric acid is allowed to act slowly on silver without using heat, nitrous acid results, which dissolves in the solution, no fumes escaping, $2\,Ag + 3\,NO_5 = NO_3 + 2\,AgO, NO_5$. The black powder remaining undissolved is finely divided gold.

ADULTERATION.—Nitrate of potash is the only one of importance; it causes the fused sticks, when broken, to present a uniform surface, instead of being radiated and crystalline and is sometimes added intentionally to increase their hardness. The following test determines its purity:—Ten grains, dissolved in distilled water, give with hydrochloric acid a precipitate, which, washed and dried, should weigh 8·44 grains; the filtered solution leaves no residue on evaporation; nitre will afford distinct crystals.

EFFECTS.—Taken in large quantity, it acts as a corrosive poison, causing an intense and persistent styptic, metallic taste, gastric pain, and distressing vomiting, though it has seldom been known to produce a fatal result.

Administered internally in the usual medical doses, it is considered tonic, and prescribed for spasmodic nervous affections, as chorea and epilepsy; when the epileptic fits do not depend on organic changes, it will occasionally effect a marked improvement, and several instances are recorded of permanent recovery; its greatest inconvenience is that, if persevered in too long, it is liable to discolour the skin; and as the indigo stain which it produces is indelible, it should always be discontinued after four or five weeks, for at least a sufficient interval to prevent accumulation in the system; the oxide and iodide of silver are asserted to possess similar medical properties without the risk of colouring the patient; and it is said that the tint will disappear under the protracted use of dilute nitric acid, of iodide of potassium, or of acid tartrate of potash: these statements are doubtful, and require confirmation. When full doses are improperly persisted in, extensive erosions of the mucous membrane of the stomach may be caused; of this accident a remarkable case is reported by Esquirol. The nitrate is also prescribed for chronic diarrhœa resulting from ulceration of the intestines, as the diarrhœa of phthisis, and some chronic dysenteric attacks; it exerts a beneficial influence in painful gastric affections, particularly when severe pain occurs immediately after eating, depending on an ulcerated state of the stomach, or excessive sensibility of that viscus, and will sometimes relieve obstinate and long-continued vomiting connected with gastric disease.

Locally applied, its primary effects are those of a mild caustic; it combines with albumen, forming a white compound, which turns deep violet, and blackens if exposed to light, from partial reduction of the silver; it is employed as an escharotic for destroying soft warts, morbid growths, such as the lining membrane of cysts, and the exuberant granulations of burns and ulcers. Rubbed freely to the unbroken integument, it vesicates, and is recommended in erysipelas, to check the extension of the eruption; for this purpose a moistened stick of caustic is passed over the sound skin, a little distance beyond the redness, to form a line of demarcation, but it fails so frequently, that the practice is seldom followed; it has the additional disadvantage in certain instances of exciting considerable pain.

When the nitrate is applied over inflamed surfaces, some believe that it operates as a direct and powerful local sedative; by others its action is supposed to be that of a counter-irritant; it is a favourite application, pencilled over incipient bubos, and along the course of the lymphatics, if attacked by acute inflammation; in paronychia, it occasionally gives speedy relief, and more often totally disappoints our expectations; it should never be applied to punctured and poisoned dissecting wounds, as, by confining the morbid matter, it may do much harm; repeated ablutions with warm water, and free bleeding, will better promote a favourable result. For unhealthy and spreading ulcers, caustics possessing greater energy are preferred, to arrest phagedena or sloughing, or to modify the diseased action of the part; afterwards nitrate of silver will induce granulation, and assist the healing of the sore; with this object it is lightly applied to the entire surface if limited, or round the edges when more extensive, avoiding the newly-formed skin; it induces the formation of a solid scab, under which cicatrization advances rapidly. A finely pointed piece of lunar caustic is advised to arrest the hæmorrhage of leech bites; it checks the bleeding, from its property of coagulating albumen; but a minute fragment of lint, used with firm and steady pressure, seldom fails, and is superior to any chemical substance.

In inflammatory affections of the fauces during scarlatina and in acute tonsillitis, the solid nitrate, or a strong solution of the salt, is brushed over the tonsils and velum; they give immediate relief, and, besides controlling the local disease, form a compound with the surface of the mucous tissue, which sheathes the tender and inflamed parts, and enables the patient to drink or swallow with comparative ease; in more severe attacks of anginose scarlatina, caustics are of trifling service, and may induce mischief, by concentrating the destructive force of the malady upon the throat, especially if applied too early or with an unsparing hand. In several diseases of the larynx and trachea, Dr. H. Green, of New York, recommends solutions of various strengths, ranging from twenty to eighty grains in f℥j.; he employs them for chronic laryngeal affections, ulcerations about the epiglottis, aphonia, strumous and syphilitic diseases, and even in acute laryngitis, applied by means of a small piece of sponge, capable of absorbing about fʒss. of the solution; this is firmly bound to a thin whalebone rod, and introduced into the larynx and trachea; in phthisis it is asserted that the larger divisions of the bronchi may be similarly treated; the practice has found few imitators here, though it appears of service for laryngeal disease, if used with discrimination.

Nitrate of silver is a valuable topical remedy in simple ulcerations of the womb; for slight abrasions and superficial ulcers the mildest caustics succeed best, as compound solutions of iodine; for those that are deeper and more extensive, disposed to bleed, or with soft fungous granulations, fused potash, or acid nitrate of mercury, may be required; in the majority of cases of an intermediate character, lunar caustic is employed; it is free from the danger of causing corrosions, and is seldom followed by any symptoms of a serious character; it should not be applied too frequently, once or twice in the week being the average rule. There is considerable risk incurred by injecting the cavity of the uterus with solutions of nitrate of silver; this practice, which is used for endometritis, has induced most violent inflammation of the pelvic viscera, and peritonitis, and cannot be safely imitated. In chronic uterine catarrh, and leucorrhœal discharge from the vagina, the affected parts are freely painted with a strong solution, at intervals of a few days, which is preferable to the solid stick, unless in severe cases, and more manageable; at the same time, emollient or astringent injections, if required, can be made use of between the periods of treatment. A similar plan is proposed for checking gonorrhœa in females; the caustic should be applied over the entire mucous surface, and has in some instances effected a cure of the discharge within twenty-four hours. With males, the injection of powerful solutions into the urethra, or strong ointments, smeared on bougies, require extreme caution; they are liable to produce grave accidents; acute urethritis, extension of inflammation to the bladder, sloughing of the urethra and stricture, violent hæmorrhage, have all resulted from them; and I have seen an aggravated epileptic fit thus induced. Weaker injections, two grains or so to f℥j., though slower in their action, are preferable, and above all attended with little risk of doing harm; they should not be used so constantly as to excite permanent irritation and discharge. In some instances of simple amenorrhœa and retarded menstruation, the application of solid nitrate of silver to the cervix uteri is stated to exercise considerable influence in promoting a healthier condition, and bringing on the discharge. In cases of obstinate pudendal pruritus, a rather strong solution is recommended to be well rubbed to the vagina and labia; this affection is so connected with constitutional derangements of the nervous system, or positive disease, that we can hardly expect mere local remedies will always prove succesful. For subacute and chronic cystitis, an injection consisting of ten to twenty grains of the nitrate, dissolved in water, f℥iv., with about gr. x. extract of belladonna added, will afford marked relief, improving the condition of the bladder, and diminishing the irritability, and frequent desire to pass water; it should be repeated, at intervals of a few days, for at least three or four times, drawing it off again, after some minutes, through a catheter. In stricture of the urethra, a fragment of lunar caustic, fastened to a wax bougie by heating the point of the instrument, is occasionally applied; the effects, if any, are to be ascribed to its influence over the vital action of the part, rather than as a caustic; a similar mode of treatment is spoken of for stricture of the œsophagus, in which it can prove of little permanent service. For obstinate cases of spermatorrhœa, there is a special instrument devised to cauterize the orifice of the seminal ducts; this operation is required only in aggravated attacks, in which it is of decided advantage. Nitrate of silver lightly touched to fissures of the lips or nipple, or to superficial ulcers and fissures of the rectum, will often cure these painful affections; it must be used sparingly, as deep cauterizations are not only unnecessary, but injurious.

The ulcers of the cornea that occur in strumous individuals are best treated by the rapid application of a pointed stick of caustic; tonic constitutional remedies, cinchona, iodide of iron, &c., are of great service at the same time; this practice is unnecessary for mere phlyctenulæ, which improve without being cauterized. In chronic attacks of conjunctivitis with purulent discharge, weak lotions are used, gr. ss. to gr. j. in f℥j., or stronger solutions, twenty grains to f℥j. dropped into the eye; a treatment particularly useful in checking the purulent ophthalmia of infants; to secure its full effects it requires to be repeated every three or four hours; it should be remembered that the protracted use of such applications will darken the conjunctiva permanently. In acute conjunctivitis, strong solutions and ointments have been advised, for the purpose of suddenly arresting the diseased action—a practice not always free from the objection of aggravating the inflammation.

To preventing pitting in small pox, Brettoneau recommended the solid nitrate to be applied to the top of each pustule appearing on the face; its advantages are dubious; if used at all, it should be early, on the first or second day of the eruption.

DOSE.—Half a grain to two grains, thrice daily, in pill; bread is an objectionable addition, soon becoming hard; the amount of common salt it contains is too insignificant to be of serious importance.

For external use, it can be diluted with nitrate of potash to any extent, before being cast into moulds; or rendered flexible by adding some chloride of silver, or a few drops of hydrochloric acid, which forms the chloride, during fusion. The best method of pointing a stick of nitrate of silver is by rubbing it to a heated piece of silver, which melts the salt. In lotions, such various strengths are employed that they range from half a grain up to forty grains in the ounce of water.*

ANTIDOTES.—**COMMON SALT**, which forms an inert chloride of silver; magnesia may also be given, and free vomiting promoted; the subsequent gastric symptoms require ordinary treatment.

SOLUTION OF AMMONIO-NITRATE OF SILVER ($AgO, NO_5 + 2\,NH_3$).—This fluid, known as Hume's test, is employed to detect arsenious acid, with which it forms a canary-yellow precipitate, $3\,AgO, AsO_3$; in preparing it, excess of ammonia is injurious, preventing the reaction; it is subject to no fallacies, though nitrate of silver causes a yellow deposit in tribasic phosphates.

PREPARATION.—Dissolve crystals of nitrate of silver, one quarter ounce, in distilled water, f℥viij., and add water of ammonia (f℥ss., or sufficient), until the precipitate first formed is nearly redissolved; clear the liquid by filtering, and add distilled water to make f℥x.

ARGENTI OXIDUM.—**OXIDE OF SILVER** (AgO).—When freshly precipitated, is a brown hydrated oxide; it readily parts with water, and if dried above 140°, becomes anhydrous; at a low red heat its oxygen escapes, leaving metallic silver; being a powerful base, it freely unites with acids; it is only slightly soluble in water, but dissolves in ammonia, the solution, if exposed to the air, gradually depositing fulminating silver.

PREPARATION.—Dissolve crystals of nitrate of silver, ℥ss., in distilled water, f℥iv.; pour into a bottle containing solution of lime, Oiijss.; shake well, and let the deposit settle; draw off the supernatant liquid; collect the deposit on a filter; wash with distilled water, f℥ixss.; dry at a heat not above 212°, and preserve in a stoppered bottle.

The lime combines with the nitric acid, forming nitrate of lime in solution, oxide of silver precipitating, $AgO, NO_5 + CaO = CaO, NO_5 + AgO$. Lime water is preferred to ammonia, which is liable to form the fulminate, and in excess redissolves the oxide.

PURITY.—The absence of chalk is shown by its dissolving in nitric acid without effervescing; twenty-nine grains, heated to redness, leave twenty-seven grains of metallic silver.

EFFECTS.—It is prescribed for all the diseases in which nitrate of silver is employed—as chorea and epilepsy, chronic bowel affections, gastralgia, and pyrosis, and is considered to possess special properties in restraining uterine hæmorrhages and leucorrhœal discharges; in some instances of dysmenorrhœa it has proved of great service; there is little risk of discolouring the skin by its use; it is also free from caustic and irritant properties, but its medical action is less evident than that of the nitrate.

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* The dark stains of nitrate of silver upon the skin are removed by a solution of cyanide of potassium. As this salt is intensely poisonous, it must be used with caution.

DOSE.—Half a grain to two grains, three or four times daily; being easily decomposed, it should not be combined with vegetable substances or creasote; a weak ointment is occasionally used for dressing venereal ulcers.

TIN (Sn).—The chief ore is a peroxide, SnO_2, or tinstone, found crystallized through primitive rocks, or in rounded masses and grains in the drift of alluvial soils; after being roasted, to remove accidental traces of arsenic and sulphur, and washed, it is reduced by carbonaceous matter in a furnace, some lime being added to combine with accidental siliceous impurities; the metal subsides, and is run into moulds, it requires a second incipient fusion to obtain pure tin, which drains out from the less fusible substances; if heated short of its melting point, and dropped from a height, it breaks into prismatic fragments, termed grain tin; the metal requires to be pure to produce this appearance.

GRANULATED TIN is got by pouring it when melted into a vessel of water; it is used for preparing the chloride. Powdered tin is procured by triturating the melted metal briskly in a heated earthenware mortar, and sieving off the fine particles; it was formerly officinal, and considered vermifuge in twenty to sixty grains doses; it has been supplanted by more effectual remedies.

Tin is a brilliant white metal, malleable and soft, having little tenacity; sp. gr. 7·3; when bent, like cadmium, it emits a crackling sound, and it has a peculiar odour if handled; it fuses at 443°, tarnishes slowly by exposure to air and moisture, and when strongly heated takes fire, burning with brilliant white light; nitric acid acts violently on it, forming an insoluble hydrated binoxide, sold as putty powder.

TESTS.—The protosalts give, with sulphuretted hydrogen or hydrosulphide of ammonium, a chocolate-brown precipitate, soluble in excess of the alkaline sulphides; and with chloride of gold, the purple powder of Cassius.

The persalts, with sulphuretted hydrogen and hydrosulphide of ammonium, afford a yellow hydrated sulphide, soluble in caustic alkalies.

SOLUTION OF CHLORIDE OF TIN ($SnCl$).—Is a colourless fluid; if evaporated, yielding crystals with 2 HO; exposed to the air it changes into a mixture of bichloride and oxychloride of tin, and is decomposed if largely diluted with water; it acts as a powerful reducing agent by absorbing oxygen, precipitates sulphur from sulphurous acid, converts per into protosalts of iron, arsenic acid into arsenious, and deposits mercury from solutions of corrosive sublimate and white precipitate.

Preparation.—Hydrochloric acid, f℥iij.; distilled water, f℥j.; mix; add granulated tin, ʒj.; apply moderate heat till gas ceases to be evolved; add water to make up to f℥v., and transfer the solution with the undissolved tin to a stoppered bottle.

When tin dissolves in hydrochloric acid, hydrogen escapes, mixed with offensive carburetted hydrogen compounds from carbonaceous impurities in the tin.

ZINC (Zn).—A highly crystalline, hard bluish-white metal; sp. gr. 6·8 to 7·1, which is tough at ordinary temperatures; between 200° and 300° it becomes ductile, and easily drawn into sheets and wire, and at 400° is so brittle that it can be pulverized; it fuses at 773°, volatilizing at a full red heat; its vapour, exposed to the air, burns, forming clouds of white oxide; in a moist atmosphere zinc soon tarnishes superficially, the adhering film of oxide protects the metal from further change. It is obtained from the sulphide or BLENDE, ZnS, which is converted into an oxide by a tedious process of roasting, or more commonly from the impure carbonate, after being heated to expel carbonic acid and water; the metal is reduced with carbon, and, subliming, passes downwards through a tube, to be condensed in water, and is purified by redistilling.

Impurities.—Traces of lead and iron are not uncommon; arsenic is more important, and often present; it is recognised by Marsh's test, the nascent arseniuretted hydrogen depositing metallic arsenic when ignited; a carbonaceous compound is the source of the offensive odour so constantly observed in hydrogen disengaged from zinc.

Tests.—The soluble salts of zinc give no precipitate with sulphuretted hydrogen in acid solutions; with hydrosulphide of ammonium they yield a white hydrated sulphide, and with ferrocyanide of potassium a white ferrocyanide.

Granulated zinc.—Obtained by pouring the fused metal into cold water, is used to prepare hydrogen; the gas evolved from it on adding dilute pure sulphuric acid, if the zinc is free from sulphurets, should not blacken paper moistened with solution of acetate of lead, and when ignited deposits no arsenical stain on porcelain held low within the flame.

ZINCI OXIDUM.—**Oxide of Zinc** (ZnO).—A light, white, tasteless, and inodorous powder, becoming pale yellow when heated, and regaining its colour on cooling; it fuses and volatilizes at high temperatures, and readily dissolves in most acids and in the caustic alkalies; this oxide was formerly obtained by throwing fragments of zinc into a large crucible placed in a furnace; they burned with brilliant flame, yielding dense white clouds of oxide, which were received in an inverted crucible above.

Preparation.—Expose carbonate of zinc, ℥vj., in a loosely covered Hessian crucible, to dull red heat, until a portion taken from the centre, and cooled, no longer effervesces with dilute sulphuric acid; let the crucible cool, and transfer the product to stoppered bottles.

By heat water and carbonic acid are expelled, leaving oxide of zinc $(ZnO, CO_2, HO + 2\,ZnO, HO) = 3\,ZnO + 3\,HO + CO_2$.

Purity.—It dissolves perfectly in dilute nitric acid without effervescing if free from carbonates; the solution is not affected by chloride of barium or nitrate of silver, containing neither sulphates nor chlorides; lastly, being a zinc salt, it gives a white precipitate with carbonate of ammonia, soluble in excess of the reagent.

Effects.—Dr. Th. Thompson advised its use to relieve nocturnal perspirations in phthisis; it is also considered tonic, and given in increasing doses for chorea, epileptic attacks, neuralgia, and gastric pain; its effects are slow, and it requires to be continued for several weeks. Applied externally, alone or mixed with starch, it forms an excellent dusting powder for excoriations, superficial ulcers, burns, and eczematous eruptions, acting as a perfectly safe absorbent; diffused in water with mucilage, it is prescribed as an injection in leucorrhœal discharges.

Dose.—Six to twenty grains, thrice daily, or oftener.

UNGUENTUM ZINCI OXIDI.—Ointment of Oxide of Zinc.—This would be equally well made by mixing the substances. It is used to dress blisters, excoriations, and superficial ulcers.

Preparation.—Melt simple ointment, ℥j., with gentle heat; add oxide of zinc in very fine powder, gr. lxxx., and stir until solidified.

ZINCI CHLORIDUM.—Chloride of Zinc ($ZnCl$).—A powerful escharotic substance, sold in opaque white fragments or rods; very deliquescent, and soluble in ether, alcohol, or water; it melts above 212°, so that its solution, when evaporated, does not solidify whilst hot; at 480° it becomes anhydrous, and distils at a red heat, partially decomposing.

Preparation.—Add gradually to granulated zinc, ℥xvj., in a porcelain basin, hydrochloric acid, f℥xliv., mixed with distilled water, Oj.; aid the action by gently warming on a sand bath until gas ceases to be evolved; boil for half an hour, supplying the water lost by evaporation, and let it stand in a cool part of the sand bath for twenty-four hours, stirring frequently; filter the product into a gallon bottle, and pour in solution of chlorine by degrees, with frequent agitation, until the fluid has a permanent odour of chlorine; add carbonate of zinc (℥ss., or a sufficiency), in small quantities at a time, until a brown sediment appears; filter through paper into a porcelain basin, and evaporate until a portion withdrawn on a glass rod solidifies on cooling; pour into moulds, and when solidified, but before it has cooled, place in close stoppered bottles.

Zinc dissolves in hydrochloric acid, disengaging hydrogen, $Zn + HCl = ZnCl + H$. Traces of lead, tin, or antimony, if present, remain undissolved, and are removed by filtering. The iron always found in ordinary zinc forms a soluble protochloride, which, by the addition of chlorine water, becomes Fe_2Cl_3; the excess of acid being got rid of by previous evaporation, carbonate of zinc will precipitate sesquioxide of iron as a brown hydrated sediment, affording pure chloride of zinc.

PURITY.—Iron is indicated by striking a deep blue with red or yellow prussiate of potash; the absence of sulphates and of lime is shown by its not precipitating with chloride of barium or oxalate of ammonia; it usually contains a small proportion of insoluble oxychloride; and M. Lassaigne has found so much as twelve per cent. of arseniate of zinc, which is separated by being insoluble in an aqueous solution of chloride of zinc.

EFFECTS.—This salt is an energetic caustic, abstracting water from the tissues, and combining with them to form a dense white slough; it is best applied to ulcerated surfaces, or where the skin is broken; it excites intense burning pain, lasting several hours; and though free from the danger of producing constitutional symptoms, like arsenical escharotics, is considered to induce a new and healthy action in the parts situated beneath the slough, dispersing morbid exudations, and causing healthy granulations to spring up; it is scarcely necessary to state that its alleged powers of extirpating genuine cancerous tumors are not to be relied on. It penetrates deeply, and is often made use of for cutaneous cancer, lupoid, strumous, or venereal ulcerations, and to destroy nævi and erectile tissues, and occasionally to arrest the progress of fungous or eroding ulcerations of the womb. M. Canquoin prepares chloride of zinc by incorporating it with two to five parts of flour, adding a few drops of water, and applies thin cakes of the paste to the affected surface. Dr. Ure mixes it with sulphate of lime; and rods formed in this manner, of any required strength, can be directed to limited surfaces.

In recent gonorrhœa, a weak solution, consisting of chloride of zinc, gr. iv., to water, f℥vj., is recommended, injected twice or thrice daily, to destroy the specific infection; and lotions of similar strength are used for ophthalmia, with purulent discharge. Internally, it has been prescribed in the treatment of scrofulous and lupoid disease, and for neuralgia, and chorea, being considered tonic and antispasmodic. Over-doses produce all the symptoms of a dangerous irritant poison, affecting also the nervous system; its action is described under "SOLUTION OF CHLORIDE OF ZINC."

DOSE.—Half a grain to three grains, thrice daily, in a sufficient quantity of fluid.

SOLUTION OF CHLORIDE OF ZINC.—Is not officinal; it was introduced some years since by Sir W. Burnett as a disinfecting and antiseptic fluid; it contains about one-fourth its weight ot the salt, having sp. gr. 2·0. This solution is largely used to destroy offensive odours, mixed with ten to sixteen parts of water; it decomposes sulphur compounds, and prevents putrefaction in animal substances; but there are no grounds for ascribing to it, or any other deodorizer, the property of destroying contagious emanations. Serious accidents have resulted from persons incautiously drinking this powerfully caustic fluid; it produces a burning, nauseous, saline taste, severe pain, vomiting, and corrosion of the mouth and stomach; followed by cold sweats, fainting, and convulsions, with muscular paralysis, and coma.

Antidotes.—Chalk, magnesia, or carbonate of soda, with diluents; they decompose the solution, and render it inert; the stomach pump is injurious in all accidents by corroding poisons.

ZINCI SULPHAS.—Sulphate of Zinc ($ZnO, SO_3, 7 HO$).—This salt, popularly termed white vitriol, should invariably be crystallized for medical use; got from solutions, at temperatures below 86°, it has seven equivalents of water; it forms colourless right-rhombic prisms, of styptic metallic taste, slightly efflorescent, and dissolving in less than its own weight of cold water; heated to 212°, it melts, and parts with 6 HO; a strong heat drives off its sulphuric acid, leaving pure oxide of zinc.

Preparation.—Mix sulphuric acid, f℥xij.; distilled water, Oiv.; add granulated zinc, ℥xvj., in a porcelain basin, and when effervescence nearly ceases, aid the action by gentle heat; filter the fluid into a gallon bottle, and gradually add, with constant agitation, solution of chlorine, until the fluid acquires a permanent chlorine odour; add, still shaking, carbonate of zinc, ℥ss., or a sufficiency, until a brown precipitate appears; let it settle; filter, and evaporate the solution till a pellicle forms, and set aside to crystallize; dry the crystals on filtering paper placed on a porous brick; the mother liquor evaporated yields more crystals.

If pure zinc were dissolved in sulphuric acid, the reaction would be $Zn + HO, SO_3 = ZnO, SO_3 + H$; it is extremely difficult of solution, whilst commercial zinc readily dissolves, the impurities acting as elements of galvanic currents. Lead, if present, is precipitated, and removed by filtering; arsenic escapes as arseniuretted hydrogen, and iron will dissolve, requiring to be separated subsequently, by peroxidizing it with chlorine; and on adding carbonate of zinc, it falls as a brown hydrated sesquioxide.

Purity.—Its solution, acidulated with sulphuric or hydrochloric acid, should not precipitate with sulphuretted hydrogen; when boiled for a few minutes with nitric acid, it yields, on the addition of ammonia, a white hydrated oxide, soluble in excess of the reagent, without colour; a blue tint would denote copper; lastly, if free from iron, the solution is not tinged purple by tincture of galls.

Effects.—Large doses seldom cause serious symptoms, being soon ejected by vomiting. In full medical doses, of fifteen grains and upwards, it operates as a safe and rapid emetic, rarely inducing nausea, or depression, and proves of much service when the object is simply to evacuate the contents of the stomach, in poisoning with narcotic or irritant substances, or to unload the bronchial tubes in the latter stages of suffocative catarrh. Given in small repeated quantities, its action is considered tonic, astringent, and antispasmodic; hence it is prescribed with occasional advantage for chronic mucous discharges of the bowels or lungs; and Dr. Paris recommended it to relieve spasmodic cough, and in affections of the chest attended with inordinate secretion, in combination with myrrh and camphor; it is also used, in gradually augmented doses, for chorea and hysteric diseases; and in America has some reputation for removing obstinate intermittents, given alone, or conjoined with quinine.

Applied topically in solution, it is largely used as an astringent injection for gleet, gonorrhœa, or leucorrhœal discharges; in lotions, for chronic and subacute ophthalmia, and as a simple eye wash in relaxed states of the conjunctiva; it arrests the excessive discharge of suppurating ulcers, burns, and extensive excoriations, and is constantly used to heal the simple, non-specific, sores remaining after the mercurial treatment of primary syphilis; for the radical cure of hydrocele, an injection of sixty grains of this salt, dissolved in water, f℥x., is a favourite mode of treatment, which seldom fails. Professor Simpson, of Edinburgh, has recommended dried sulphate of zinc in powder, or made into paste with a little glycerine, as a powerful, rapid, and manageable escharotic; he applies it to destroy soft warty excrescences and condylomata; in removing the red sensitive tumors which form at the orifice of the urethra of females; for indurated inflammatory ulcerations of the cervix uteri, and to lupoid and other chronic ulcers of the skin; and, mixed with sulphuric acid, he uses it to malignant and other tumors as a rapid and safe caustic, to excite deep sloughing, and detach them from the surrounding healthy tissues.

Dose.—As a tonic and antispasmodic, one to two grains, gradually increased to five grains or upwards, thrice daily; fifteen to twenty grains are emetic; for eye lotions, and as an injection, one to three grains, or more, dissolved in water, f℥j.

ZINCI CARBONAS.—**Carbonate of Zinc** ($ZnO, CO_2, HO + 2 ZnO, HO$).—A white, tasteless, and inodorous powder; insoluble in water, perfectly dissolving with effervescence in dilute acids; the impure carbonate, formerly used in medicine, termed calamine, was pink, and so largely adulterated with sulphate of barytes and oxide of iron that it seldom contained a trace of zinc.

Preparation.—Dissolve carbonate of soda, ℥xss., in boiling distilled water, Oj., placed in a capacious porcelain vessel; add sulphate of zinc, ℥x., also dissolved in distilled water, Oj.; boil for fifteen minutes after effervescence ceases, and let the precipitate subside; decant the supernatant liquid; pour on the precipitate distilled water, Oiij., agitating briskly; let the precipitate again subside, and repeat the washings and subsidings until the fluid no longer precipitates with chloride of barium; collect the precipitate on calico; drain, and dry it with gentle heat.

No neutral carbonate can be got by decomposing the zinc salts, carbonic acid always escaping. The precipitate consists of hydrated oxide and hydrated carbonate, the composition being liable to vary. The reaction can be represented as $3\ ZnO, SO_3 + 3\ NaO, CO_2 + Aqua = 3\ NaO, SO_3 + 2\ CO_2 + (ZnO, CO_2, HO + 2\ ZnO, HO)$.

Purity.—The absence of chalk is shown by its dissolving without effervescence in dilute nitric acid; the solution gives no precipitate with chloride of barium or nitrate of silver, being free from sulphates and chlorides; lastly, it yields with carbonate of ammonia a white hydrated oxide, soluble in excess of the reagent, without colour; traces of copper derived from impure sulphate of zinc would give a blue tint.

Uses.—To prepare the acetate and the oxide of zinc; it forms an excellent local astringent for dusting over excoriations, superficial burns, and cutaneous eruptions, for which purpose it may be mixed with two to six parts of starch or violet powder, or employed in ointment with simple cerate.

ZINCI ACETAS.—Acetate of Zinc ($ZnO, C_4H_3O_3 + 2\ HO$).—Occurs in soft pearly plates of white colour, consisting of modified hexagonal tables, odourless, of astringent metallic taste; it effloresces in dry air; is very soluble in water; decomposed by boiling alcohol, depositing a basic acetate; and with sulphuric acid evolves acetic acid.

Preparation.—Acetic acid, f℥iij.; distilled water, f℥vj.; mix in a flask, and add carbonate of zinc, ℥ij., in successive portions; heat gently; add f℥ij. more of acid until the carbonate is dissolved; boil for a few minutes; filter whilst hot, and set aside for two days to crystallize; decant the mother liquid; evaporate to one half, and again set it aside for two days to get more crystals; place the crystals in a funnel to drain; then dry them by exposure to the air on filtering paper placed on a porous brick.

The acetic acid replaces carbonic acid, which escapes, $ZnO, CO_2 + C_4H_3O_3 = CO_2 + ZnO, C_4H_3O_3$.

Purity.—A dilute watery solution, is not affected by chloride of barium or nitrate of silver, showing its freedom from sulphates and chlorides; and when slightly acidulated with hydrochloric acid, is not precipitated by sulphuretted hydrogen, proving the absence of iron; lastly, after being boiled for a few minutes with nitric acid, it yields with ammonia a white hydrated oxide, entirely soluble in excess of ammonia, without colour; traces of copper would strike a blue hue.

Effects.—Its properties resemble those of sulphate of zinc; it is almost exclusively used for external purposes, one to four grains being dissolved in water, f℥j., for lotions, injections, or collyria; or Sir A. Cooper's formula can be prescribed—of sulphate of zinc, gr. v., mixed with dilute solution of subacetate of lead, f℥iv.

ZINCI VALERIANAS.—**Valerianate of Zinc** ($ZnO, C_{10}H_9O_3$).—Crystallizes in brilliant pearly-white tabular plates, having a faint odour of valerianic acid, and an astringent, metallic taste; it dissolves sparingly in cold water, is soluble in hot water and alcohol, and if heated to redness in an open crucible, oxide of zinc remains, which, dissolved by dilute sulphuric acid, gives a white precipitate with hydrosulphide of ammonium.

Preparation.—Dissolve sulphate of zinc, 5¾ ounces; valerianate of soda, ℥v., each in distilled water, Oij.; raise both solutions nearly to boiling; mix; cool, and skim off the crystals produced; evaporate the mother liquid at a heat not above 200°, till reduced to f℥iv.; cool again, and remove the crystals which form, and add them to those already obtained; drain them on a paper filter, washing with a little cold distilled water till the washings give but a feeble precipitate with chloride of barium; again drain, and dry on filtering paper at ordinary temperatures.

The acids mutually change bases, $ZnO, SO_3 + NaO, C_{10}H_9O_3 = NaO, SO_3 + ZnO, C_{10}H_9O_3$. When preparing the salt, a temperature not exceeding 150° is preferable, as a stronger heat causes it to adhere to the capsule and decompose.

Purity.—The absence of sulphates is shown by its solution in hot water not precipitating with chloride of barium. Distilled with dilute sulphuric acid, the product, mixed with solution of acetate of copper, does not immediately affect the transparency of the fluid, but forms after a time oily drops, which gradually pass into a bluish-white crystalline deposit; this will detect butyrate of zinc—an alleged adulteration; butyric acid, $C_8H_7O_3, HO$, forming an immediate white deposit with acetate of copper.

Effects.—This salt, proposed originally for medical use by Prince Louis Lucien Bonaparte, is prescribed as an antispasmodic, in chorea and nervous affections, for cardiac palpitation, and neuralgic pains, particularly in hysterical neuralgia. Dr. Neligan used it with advantage in treating the ordinary convulsive affections of children, and considered it to have some anthelmintic powers.

Dose.—Half a grain to three grains, twice or thrice daily; being sparingly soluble in water, it is best given in pill or powder.

CYANOGEN (Cy, or C_2N).—This gaseous substance derives its name from being an essential constituent of Prussian blue; its elements do not combine directly; but when an organic substance is heated in the presence of some base, as potash, the nitrogen and carbon unite with it, producing a cyanide; it is obtained in the gaseous state by heating cyanide of silver or of mercury; the latter separates into cyanogen, mercury, and a dark substance resembling carbon, which is an allotropic modification of cyanogen, termed paracyanogen. Cyanogen is transparent, colourless, of penetrating odour, and poisonous; it dissolves in alcohol, and water; its aqueous solution rapidly decomposes under light; it is liquefied by pressure, and burns with a distinctive blue flame, surrounded by a pink halo; from its property of combining with substances similar to an elementary body, it is designated an organic radical, and approximates to chlorine and iodine in its chemical relations.

HYDROCYANIC ACID (HCy, or C_2NH).—Prussic acid was discovered by Scheele, in 1782; for medical purposes it is obtained by decomposing the metallic cyanides, or from ferrocyanide of potassium; it can also be got from laurel leaves, peach and plum kernels, or their blossoms, being produced by the decomposition of the amygdalin which they contain. Pure anhydrous prussic acid is intensely poisonous, and requires the utmost care in examining; it is a colourless, transparent liquid, so volatile, that a drop exposed to the air will partly solidify, from the cold produced by the evaporation of the other portion; it irritates the eyes, and if respired, even diluted, causes giddiness, acrid sensations in the throat, and insensibility; it burns with a bright flame, and with air forms an explosive mixture; if kept, it rapidly decomposes, evolving ammonia, becoming brown and depositing paracyanogen.

ACIDUM HYDROCYANICUM DILUTUM.—DILUTE HYDROCYANIC ACID (A solution of two per cent. of hydrocyanic acid in water).—The acid directed by the Pharmacopœia is a colourless liquid, with peculiar odour, resembling, but perfectly distinct from that of bitter almonds; its taste is described as warm and pungent; it excites a special feeling of acridity in the throat and nose; and Professor Taylor some years since called attention to the remarkable fact, that some individuals easily perceive its smell, others complain only of the constriction of the fauces, and a few appear totally incapable of recognising it; though termed an acid, its reactions are extremely faint, it reddens litmus slightly and transiently, and cannot expel carbonic acid from carbonates; its tendency to decomposition is retarded by the addition of a few drops of dilute sulphuric or hydrochloric acid, and by being preserved in closed bottles in the dark.

PREPARATION.—Dissolve ferrocyanide of potassium, 2¼ ounces, in distilled water, f℥x.; add sulphuric acid, fʒvij., previously diluted with distilled water, f℥iv., and cooled; place in a retort, and adapt to this a receiver containing distilled water, f℥viij., which must be kept carefully cooled; distil with gentle heat by the aid of a sand bath, until the fluid in the receiver measures f℥xvij.; add to this distilled water, f℥iij., or enough to make the acid of the required strength of two per cent.

By distilling ferrocyanide of potassium with dilute sulphuric acid, hydrocyanic acid distils off, leaving bisulphate of potash, and Everitt's yellow salt, which gradually passes into Prussian blue; $2\ K_2FeCy_3 + 6\ HO, SO_3 = 3\ HCy + 3\ (KO, HO, 2\ SO_3) + Fe_2KCy_3$.

In this process a loss takes place, which may amount to fourteen per cent. of the acid, from the formation of formate of ammonia, $C_2N, H + 4\ HO = C_2HO_3, NH_4O$. This appears particularly liable to occur when the sulphuric acid is used in excess. Two atoms of oil of vitriol are employed, as the amount which produces neutral sulphate of ammonia would endanger the safety of the apparatus by the violent and explosive ebullition it causes.

TESTS.—With nitrate of silver, hydrocyanic acid forms a white cyanide, soluble in nitric acid, unchanged with sunlight, and if dried and heated in a tube evolving cyanogen. By adding a drop or two of mixed proto and perchloride of iron to any suspected fluid, then a slight excess of potash solution, and lastly some hydrochloric acid, Prussian blue is formed in proportion to the amount of cyanogen present. Liebig's test is to evaporate the fluid with a little bisulphide of ammonium, which converts prussic acid into sulphocyanide of ammonium, NH_4, CyS_2; this, dissolved in water, strikes a blood-red colour with persalts of iron; the ordinary hydrosulphuret of ammonia when kept some time becomes yellow, and will answer perfectly; if freshly made, a minute quantity of sulphur should be added before testing.

STRENGTH.—Its sp. gr. is 0·997, becoming lighter in proportion to its strength, but this is open to too many disturbing circumstances to be relied on; and as sold it often contains a few drops of some mineral acid added to make it keep, which augments its density. "SCHEELE'S ACID" has about double the amount of hydrocyanic acid in the officinal solution, or four per cent. of real acid.

When f℥ss. of the dilute acid of the pharmacopœia is treated with excess of solution of soda, it requires the addition of 80·66 measures of the volumetric solution of nitrate of silver, before a permanent precipitate begins to form, corresponding with two per cent. of anhydrous acid; this process devised by Liebig affords a soluble double salt, the cyanide of silver and sodium, $AgCy + NaCy$, until an excess of nitrate of silver begins to be added, when a permanent deposit of cyanide of silver forms; one atom of the nitrate being thus equivalent to two of prussic acid.

PURITY.—Dr. Geoghegan's ingenious test detects the presence of a mineral acid: the white salt formed by adding cyanide of mercury to iodide of potassium, and crystallizing, placed in pure hydrocyanic acid remains unchanged; other acids develope the scarlet iodide of mercury.

To obtain hydrocyanic acid free from these accidental acid impurities, it requires to be distilled with some chalk or marble, which combines with them.

Effects.—In excessive doses it proves rapidly destructive of life; the symptoms which it causes may commence instantaneously, and are seldom delayed beyond one or two minutes; the person becomes insensible, his eyes are bright and glistening, with dilated pupils; the respiration slow and gasping; the skin feels cold and clammy, and the pulse almost imperceptible, death ensuing within two to ten minutes in most cases, occasionally preceded by convulsions. If taken in smaller quantity, it causes constriction of the throat, vertigo, and nausea, with rapid loss of muscular power; sometimes there are efforts to vomit, followed by epileptiform fits, frothing at the mouth, spasmodic breathing, and insensibility; these symptoms may become developed suddenly, or be deferred for some minutes, during which time the individual is capable of voluntary acts; and if death does not take place within half an hour to an hour, recovery may be hoped for. One grain of the anhydrous acid, or its equivalent in a dilute state, is probably a minimum fatal dose; in suicidal cases much more is usually taken, and hence the majority terminate in death. The autopsy seldom reveals much beyond a gorged state of the venous system; the body or the stomach after being opened may smell of prussic acid; by distilling the contents of the stomach, previously neutralized, or, if necessary, rendered faintly acid by tartaric acid, traces of the poison are obtained for examination. Caspar has in some few cases observed formic acid after death derived from decomposition of the hydrocyanic acid. It would appear, after becoming absorbed and entering the blood, to operate as a direct sedative upon the heart, or to kill from obstruction to the respiration; its effects having a close resemblance to epilepsy.

In medical doses it is prescribed for gastrodynia; it is most useful when the pain follows immediately after eating, and depends on excessive sensibility of the gastric mucous membrane; it will also relieve pyrosis, for which it is given in some bitter infusion with bismuth or soda, and is occasionally of service in obstinate chronic vomiting and hiccup; as a sedative, it is employed in rheumatic, cancerous, and nervous affections; for palpitations of the heart caused by hysteria or functional derangement; to allay spasmodic cough, in asthma, hooping cough, and chronic catarrh, and sometimes added to expectorants when the cough is troublesome in phthisis; or to astringent mixtures for colliquative diarrhœa, but its effects in the latter case are trifling. Applied externally in lotion, it is used for cutaneous eruptions with excessive itching—as prurigo; some recommend it for impetiginous rashes; when the skin is abraded, its effects should be carefully watched; it forms a useful addition to embrocations in localized neuralgic attacks.

Antidotes.—Cold affusion should be used to the head and spine; artificial respiration kept up, and chlorine or ammonia diffused through the air, or, if possible, swallowed in solution. Messrs.

Smith, of Edinburgh, advise carbonate of potash, gr. xx., with water, f℥j.; and immediately after sulphate of iron, gr. x., muriated tincture of iron, fʒj., in water, f℥j., to form inert Prussian blue; this quantity will suffice for about gr. ij. of the anhydrous acid.

Dose.—Two to four drops, taken three or four times in the day in some fluid; it ought to be prescribed in separate draughts, to avoid the risk of an overdose; for lotions, fʒij. can be added to eight ounces of water.

ALCOHOLS.—Several homologues of wine alcohol are known, of which three are of interest in medicine—the ethylic, methylic, and amylic alcohols; they all consist of two equivalents of oxygen, combined with carbon and hydrogen, the latter exceeding by two the carbon equivalents; by partial oxidation they afford aldehyds, and by further absorption of oxygen form important acids; they also yield ethers, by the loss of one atom of hydrogen and oxygen.

$$\left.\begin{array}{lll}\text{Methylic alcohol,} & & C_2H_3O,\ HO \\ \text{Ethylic} & ,, & C_4H_5O,\ HO \\ \text{Amylic} & ,, & C_{10}H_{11}O,\ HO\end{array}\right\} - 2H + 2O = \left\{\begin{array}{l} C_2HO_3,\ HO,\ \text{Formic acid;} \\ C_4H_3O_3,\ HO,\ \text{Acetic acid ;} \\ C_{10}H_9O_3,\ HO,\ \text{Valerianic acid.}\end{array}\right.$$

METHYLIC ALCOHOL (C_2H_3O, HO).—Pyroxylic, or wood spirit, is procured in an impure form by the destructive distillation of wood; it has lately been obtained free from odour, as a limpid, colourless, inflammable fluid, tasting like alcohol, but rougher; sp. gr. at 68°, 0·798; it boils at 149·9°; its other properties resemble those of wine alcohol, from which it is distinguished by yielding formic acid, when slowly oxidized with platinum black. Methylated spirit, much used for commercial purposes, is a mixture of spirit of wine with ten per cent. of impure methylated alcohol; its use in pharmaceutic preparations cannot be justified. Its chief derivative is chloroform.

SPIRITUS PYROXILICUS RECTIFICATUS.—Rectified Pyroxylic Spirit.—Is officinal; it consists of methylic alcohol, with about ten per cent. of water; sp. gr. 0·841 to 0·846. It should have no reaction on litmus paper, be free from smoky taste, and not become turbid on the addition of water. This spirit, in an impure state, was used in treating phthisis, and has some effect in checking chronic vomiting, given in doses of thirty to forty drops, diluted with water.

CHLOROFORMUM.—Chloroform (C_2HCl_3).—A limpid, colourless, volatile liquid, of powerful ethereal odour, and agreeable sweet taste; sp. gr. 1·496; soluble in ether or alcohol, and very sparingly dissolved in water; it burns with difficulty, with a green and smoky flame; the density of its vapour is high, being 4·2. It acts as an energetic solvent, freely dissolving sulphur, phosphorus, iodine, bromine, camphor, fatty and resinous substances, caoutchouc, &c., and is usefully employed to render many alkaloids soluble, or to separate them from solutions. 100 parts of chloroform will take up of

Veratria, . .	58·49 parts.	Atropia, . . .	51·19 parts.
Quinia, . .	57·47 ,,	Morphia, . .	0·57 ,,
Brucia, . .	56·70 ,,	Narcotin, . .	31·17 ,,
Strychnia, . .	20·19 ,,	Cinchonia, . .	4· 7 ,,

Chemically, it may be considered similar in composition to formic acid, C_2HO_3, with chlorine replacing the oxygen; it has also been regarded as the homologue of chloride of methyl, C_2H_3Cl, in which 2 H are replaced by 2 Cl.

Preparation.—Place water, three gallons, rectified spirit, f℥xxx., in a capacious still; heat to 100°; add chlorinated lime, lb. x., slaked lime, lb. v., mixing thoroughly; connect the still with a condensing worm surrounded by cold water, and terminating in a narrow-necked receiver; heat so as to cause distillation, taking care to withdraw the fire the moment the process is well established; when the distilled product measures f℥l., withdraw the receiver; pour its contents into a gallon bottle, half filled with water, mix well by shaking, and set at rest for a few minutes, when the mixture will separate into two strata of different densities; let the lower, which is crude chloroform, be washed by agitation with distilled water, f℥iij.; let it subside, and repeat the washing twice more with fresh water; agitate the washed chloroform for five minutes in a bottle with an equal volume of sulphuric acid; let the mixture settle, and transfer the upper stratum to a flask containing chloride of calcium in small fragments, ℥ij., mixed with slaked lime, ℥ss., which should be perfectly dry; mix well by agitation; after an hour connect the flask with a Liebig's condenser, and distil over the pure chloroform by means of a water bath; preserve the product in a cool place, in bottles with accurate ground glass stoppers.

The lighter liquid which floats on the crude chloroform, after its agitation with water, and the washings with distilled water, should be kept and used for subsequent operations.

The reaction that ensues in preparing chloroform can be represented by alcohol and chlorinated lime, which yield chloroform, formate of lime, water, and chloride of calcium, the quick lime increasing the product by its affinity for formic acid, $2\,C_4H_6O + 8\,(CaO, ClO + CaCl) = C_2HCl_3 + 3\,CaO, C_2HO_3 + 8\,HO + 13\,CaCl$.

During distilling the heat must be regulated to avoid explosions; the repeated washings with water in purifying remove any spirit, which is preserved for subsequent use. Agitation with sulphuric acid gets rid of traces of water, and chars oily hydrocarbons. Prolonged contact with acid is injurious, causing decomposition of the chloroform; being lighter, it floats on the acid, and, containing a little sulphurous and sulphuric acids, requires to be redistilled from the slaked lime and chloride of calcium.

Purity.—Chloroform prepared from methylated spirits is sold; this is seldom free from offensive odour, and only fit for external uses. It should not be coloured by sulphuric acid; placed on the the hand, it evaporates, leaving no residue or unpleasant smell; and if potassium is dropped into it, evolves no gas, showing the absence of spirit. The amount of alcohol that is present in adulterated chloroform can be determined by agitation with water, in which it dissolves.

Effects.—Excessive doses of chloroform taken internally cause narcotic symptoms, and, should the patient survive, violent inflammation and ulceration of the stomach may be expected. When respired, it has occasionally caused fatal results; such accidents are most liable to occur with persons suffering from valvular disease or fatty degeneration of the heart, or other grave internal malady; it also directly paralyzes the heart, if inhaled in too concentrated a state; and even when sufficiently diluted with air, if long continued, arrests the respiration, the heart still beating for some time after breathing has ceased; in such cases artificial respiration and cold effusion should at once be tried, and stimulants, if possible, administered.

Prescribed internally, in small doses of five to fifteen drops, it is antispasmodic and stimulating; it relieves attacks of flatulent colic, hysteria, cardiac palpitation, and other affections for which ether is employed; dissolved in a little brandy, it alleviates nausea and obstinate vomiting, and is said to have considerable influence over sea sickness. Full medical doses of thirty to forty drops are anodyne, often given combined with opiates for delirium tremens; or in cases where opium disagrees, to allay nervous irritability, and induce sleep during fevers, neuralgic pain, &c.

When inhaled, its vapour requires to be largely diluted with atmospheric air, the chloroform not exceeding, at the outside, four to six per cent. of the mixture. Several forms of apparatus are in use; with moderate attention, it can be given equally well dropped on a folded handkerchief; most of the accidents laid to its charge have occurred from employing it for trivial operations, in which it is perfectly unnecessary; it is better, if possible, to exhibit it upon an empty stomach, as vomiting is not an unusual result, and the ejected matters are in danger of lodging in the larynx; the best position to select is recumbent, free from restraint about the chest or throat, with the head well raised. Within a few seconds after commencing to respire chloroform, it causes noise in the ears and slight vertigo, with numbness and thrilling over the body; gradually sensation disappears, commencing in the extremities, perception soon follows, and the person falls into a state closely resembling the insensibility from intoxication; in some this is preceded by nervous excitement, rambling, incoherent expressions, and involuntary movements; these are most obvious in excitable individuals and drunkards, its respiration being particularly dangerous with persons suffering from delirium tremens, in whom it brings on severe epileptiform attacks, and fatal results have been known to follow. In health, perfect anæsthesia occurs within less than a minute, and is seldom delayed beyond two; it lasts about ten or fifteen minutes, passing off rapidly, unless renewed by another application; occasionally tranquil sleep will ensue, if the patient is permitted to remain quiet. Its numberless uses in operative surgery, in securing complete immunity from pain, has obtained for Professor Simpson the gratitude of mankind. By relaxing muscular contraction, it aids the reduction of dislocations and strangulated hernias, and seldom fails in spasmodic stricture to afford relief, or to enable a catheter to be passed. In acute tetanus, remedies are of little use; the chronic or subacute attacks and severe choreic affections are benefited by free inhalation of chloroform, which has sometimes been continued for hours without intermission. For midwifery it is seldom employed in Dublin, unless in exceptional and operative cases, and for convulsions occurring during labour; Dr. Atthill attributes to it a tendency to increase postpartum hæmorrhage. There are few painful or spasmodic diseases in which it has not been given, as obstinate hiccup, asthmatic attacks, hooping cough, hysterical affections, to relieve the paroxysms of neuralgia, and the distressing pain attending the passage of renal and biliary calculi.

Professor Langenbeck has successfully employed it for injecting hydroceles; a few drops are thrown into the cavity of the tunica vaginalis, and permitted to remain there; it appears to cause little or no pain, but blisters the external parts if allowed to fall on them. If prevented from evaporating, when applied externally, it acts as a powerful local irritant; in liniment, it is a useful stimulating application for rheumatic, neuralgic, and other painful affections.

Dose.—Given internally, doses of five to fifteen drops act as a diffusible stimulant; thirty to forty drops are anodyne; it requires to be suspended with mucilage or liquorice powder, being comparatively insoluble in water.

Antidotes.—None known: artificial respiration should be used, and an electric current directed from the nape to the diaphragm, ammonia being applied to the nose. If swallowed, it must be got rid of by emetics or the stomach pump, and the subsequent inflammation treated.

SPIRITUS CHLOROFORMI.—Spirit of Chloroform.—This solution is miscible with water, even when containing much saline matters; it is prescribed as a diffusible stimulant; its sp. gr. is 0·871.

Dose.—fʒss. to fʒj.

Preparation.—Chloroform, f℥j.; rectified spirit, f℥xix. Mix.

LINIMENTUM CHLOROFORMI.—Liniment of Chloroform.—A local stimulant for chronic rheumatism, neuralgic pains, pleurodynia, and other affections requiring counter-irritation; if used with freedom, it is a rather powerful rubefacient.

PREPARATION.—Chloroform, liniment of camphor, each f℥ij. Mix.

ALCOHOL (C_4H_5O, HO).—Absolute wine alcohol, or the hydrate of oxide of ethyl; sp. gr. 0·795; is a colourless, volatile, inflammable liquid; having a penetrating spiritous odour, and an acrid burning taste, rapidly abstracting water from the tissues of the tongue; it boils at 173°, and cannot be frozen, merely becoming viscid by intense cold; when burned, it emits considerable heat, with little light, and is converted into water and carbonic acid; if exposed to the air it soon evaporates, and will attract moisture, like sulphuric acid.

PREPARATION.—Introduce recently burned lime, ℥xviij., and rectified spirit, Oj., into a matrass connected with a Liebig's condenser; apply heat until the lime begins to slake, and when this process is completed, distil by means of a chloride of zinc bath, until the liquid which comes over, together with that obtained during the slaking, measures f℥iss.; reject this, and continue the distillation into a fresh receiver until the product measures f℥xvj.

In this process the lime, whilst slaking, combines with much of the water, and a portion is expelled by the heat disengaged, and by the commencement of the distillation, mixed with weak spirit, which is rejected, the strong alcohol coming over afterwards.

THEORY.—Grain may be considered as consisting of starch, $C_{12}H_{10}O_{10}$, and a nitrogenous substance—gluten; during the process of germination, the gluten appears to be converted into diastase, which exerts a special catalytic action on the starch particles, changing them into dextrine, or into grape sugar, fitted for the nutrition of the young growing embryo. This natural process is imitated in malting, the grain being forced to germinate under the influence of artificial warmth and moisture; so soon as the radicle is fully protruded, and the gluten passed into the condition of diastase, it is strongly heated and kiln-dried, to destroy the vitality of the embryo, which prevents the assimilation of the saccharine matter. When malt is ground, and mashed in warm water, the starch gradually passes into dextrine—a substance resembling gum in its viscid adhesive properties, and differing from starch, being unaffected by iodine and dissolving in cold water; it next is changed to glucose, or grape-sugar, $C_{12}H_{14}O_{14}$, fixing the elements of water; from this substance alcohol is obtained, yeast being added, and the solution fermented at a temperature between 70° and 80°; it may be assumed for theoretic explanation, that glucose is completely separated into carbonic acid, water, and alcohol, $C_{12}H_{14}O_{14} = 4\,CO_2 + 2\,HO + 2\,C_4H_6O_2$.

USES.—Pure alcohol is officinal for testing castor oil, which perfectly dissolves in it; and also croton oil, which forms a clear solution, heated with its own volume of this spirit, about three-fourths again separating upon cooling.

SPIRITUS RECTIFICATUS.—Rectified Spirit (Alcohol with sixteen per cent. of water).—Is obtained by rectifying whiskey or other alcoholic fluid with some saline substance, as carbonate of potash, or chloride of sodium, having considerable affinity for water, and capable of abstracting it from the spirit which distils over in a concentrated state; it should be a clear, colourless fluid, with strong spirituous taste, and pure alcoholic flavour, though usually it contains a little fousel oil, which renders its odour somewhat unpleasant; this is best removed by redistilling with caustic potash, or digesting with recently burned charcoal; its sp. gr. is 0·838.

Purity.—Its strength is determined by its density; it should not become turbid when diluted with water; the presence of small quantities of fousel oil, or other organic matters, is recognised by adding to rectified spirit, f℥iv., three measures of the volumetric nitrate of silver solution; exposed to bright light for twenty-four hours, and decanted from the black powder which forms, it undergoes no further change when again exposed to light with more of the test liquid, if sufficiently pure for medical use. According to Vogel, a red coloration is developed by the fousel oil.

Uses.—To form proof spirit; to dissolve essential oils in preparing the officinal spirits; and for making several tinctures, particularly those with resinous and oily constituents.

SPIRITUS TENUIOR.—Proof Spirit (Alcohol, with about fifty-one per cent. of water).—This should always be made by diluting rectified spirit, to avoid the impurities and colouring matter present in ordinary whiskey; its sp. gr. is 0·920. The term "proof spirit" by Act of Parliament is applied to a spirit of which thirteen volumes at 51° weigh as much as twelve volumes of water; a considerable diminution in bulk occurs in its preparation, the "contraction" being about f℥iv. in the gallon.

Preparation.—Rectified spirit, Ov.; distilled water, Oiij. Mix.

Used—For making those tinctures which do not contain resinous or oily principles.

OFFICINAL TINCTURES.—Class 1.—Made by percolating with proof spirit.

Preparation.—The substance, bruised or in coarse powder, is macerated for forty-eight hours in a close vessel, with f℥xv. of proof spirit, agitating occasionally, then transferred to a percolator, and when fluid ceases to pass, ℥v. more of the spirit added. When the percolation is complete, subject the residue to pressure; filter the product; mix the two liquids, and add sufficient proof spirit to make up Oj.

	Quantity used.		Quantity used.
BUCHU, ...	℥ijss.	HOP, ...	℥ijss.
CALUMBA, ...	,,	SAVIN, ...	,,
CASCARILLA,. . . .	,,	SQUILL, ...	,,
CHIRETTA, ...	,,	SENEGA, ...	,,
CINNAMON, ...	,,	SERPENTARIA, . . .	,,
COLCHICUM (seeds), .	,,	STRAMONIUM (seeds), .	,,
CONIUM (fruit), . .	,,	VALERIAN, ...	,,
DIGITALIS, ...	,,	CANTHARIDES, . . .	¼ oz.
GALLS, ...	,,	BELLADONNA (leaves) .	℥j.
HYOSCYAMUS, ...	,,	SAFFRON, ...	,,
JALAP, ...	,,	ORANGE (peel), . . .	℥ij.
KRAMERIA, ...	,,	YELLOW BARK, . . .	℥iv.
LEMON(PEEL), ...	,,	ERGOT, ...	℥v.
LOBELIA, ...	,,		

CATECHU, ℥ij.; Cinnamon, ℥j.

CARDAMOMS (COMPOUND).—Cardamoms, caraway, of each, one-quarter ounce; raisins, ℥ij.; cinnamon, ℥ss.; cochineal, gr. lx.

GENTIAN (COMPOUND).—Gentian, ℥jss.; orange, three-quarters of an ounce; cardamoms, one-quarter ounce.

BARK (COMPOUND).—Pale bark, ℥ij.; orange, ℥j.; serpentaria, ℥ss.; saffron, gr. lx.; cochineal, gr. xxx.

RHUBARB.—Rhubarb, ℥ij.; cardamoms, coriander, saffron, of each, one-quarter ounce.

CLASS 2.—Made by percolation with rectified spirit.

PREPARATION.—Similar to to Class 1, using rectified spirit, Oj.

	Quantity used.		Quantity used.
ACONITE (root), . .	℥ijss.	ARNICA (root), ...	℥j.
MYRRH, ...	,,	CAPSICUM, ...	¾ oz.
GINGER, ...	,,	NUX VOMICA, ...	℥ij.

CLASS 3.—Made by maceration with proof spirit.

PREPARATION.—Macerate the constituents in coarse powder with proof spirit, Oj., for seven days; filter the liquor, and add more proof spirit to make up Oj.

ALOES.—Quantity used—Aloes, ℥ss.; extract of liquorice, ℥jss.

OPIUM.—Quantity used—Opium, ℥jss.

CAMPHORATED TINCTURE OF OPIUM.—Quantity used—Opium, gr. xl.; benzoic acid, gr. xl.; camphor, gr. xxx.; oil of anise, fʒss.

CLASS 4.—Made by maceration with rectified spirit.

PREPARATION.—Similar to Class 3, using rectified spirit, Oj.

ASSAFŒTIDA.—Quantity used, ℥ijss.

COCHINEAL.—Quantity used, ℥ijss.

TOLU.—Quantity used, ℥ijss. (macerate for six hours).

KINO.—Quantity used, ℥ij.

CASTOR.—Quantity used, ℥j.

Benzoin (Compound).—Quantity used—Benzoin, ℥ij.; prepared storax, ℥jss.; balsam tolu, ℥ss.; Socotrine aloes, 160 grains.

Lavender (Compound).—Quantity used—Cinnamon, 150 grains; nutmeg, 150 grains; red saunders wood, 300 grains; rectified spirit, Oij. Macerate for seven days; press out; strain, and dissolve in the tincture English oil of lavender, fʒjss.; English oil of rosemary, ten minims; and add sufficient rectified spirit to make up Oij.

Class 5.—Prepared by simple solution.

Quinine (Compound).—Quantity used—Sulphate of quinine, 160 grains; tincture of orange peel, Oj.; digest seven days, and strain.

Indian Hemp.—Quantity used—Extract of Indian hemp, ℥j.; rectified spirit, Oj. Dissolve.

Perchloride of Iron.—Solution of the perchloride, f℥v.; rectified spirit, f℥xv. Mix.

Iodine.—Iodine, ℥ss.; iodide of potassium, one-quarter of an ounce; rectified spirit, Oj. Dissolve.

Class 6.—Ethereal and ammoniacal tinctures.

Preparation.—Macerate for seven days; then press, strain, and make up the quantity to Oj.

Lobelia (Ethereal).—Quantity used—Lobelia, ℥ijs.; spirit of ether, Oj.

Guaiac (Ammoniated).—Quantity used—Guaiac resin, ℥iv.; aromatic spirit of ammonia, Oj.

Valerian (Ammoniated).—Quantity used—Valerian, ℥ijss.; aromatic spirit of ammonia, Oj.

ÆTHER.—**Ether** (Oxide of Ethyl, C_4H_5O, with about eight per cent., by volume, of alcohol).—A limpid, colourless, highly volatile liquid, with peculiar, powerful, and fragrant odour, and pungent cooling taste; when evaporating, causing intense cold; sp. gr. 0·735; it boils below 105°, and at ordinary temperatures gives off dense inflammable vapour, which forms an explosive mixture with air or oxygen. It dissolves freely in rectified spirit; water, agitated with it, will take up one-eighth its bulk of ether, and ether also absorbs about one-eighth its volume of water; it abstracts chloride of mercury, terchloride of gold, and sesquichloride of iron, from their aqueous solutions; bromine and iodine are readily soluble in it, also fatty substances, volatile oils, caoutchouc, and several of the modifications of pyroxylin.

Preparation.—Mix sulphuric acid, f℥x., rectified spirit, f℥xij., in a glass matrass capable of holding Oij., and without allowing the mixture to cool, connect the matrass by a bent glass tube with a Liebig condenser, and distil with a heat sufficient to maintain the liquid in brisk ebullition; when the ethereal fluid begins to pass over, supply fresh spirit through a tube into the matrass in a continuous stream in such quantity as to equal the volume of fluid which distils over; this is best done by using a tube furnished with a stop-cock to regulate the supply, connecting one end of the tube with a vessel containing the spirit raised above the level of the matrass, and passing the other end through the cork fitted into the matrass; when the whole of the spirit has been added, and f℥xlij. have distilled over, the process may be stopped; dissolve chloride of calcium, ℥x., in distilled water, f℥xiij.; add slaked lime, ʒss., and agitate the mixture in a bottle with the impure ether; leave the mixture at rest for ten minutes; pour off the light supernatant fluid, and distil it with gentle heat until a glass bead of sp.gr. 0·735 placed in the receiver begins to float. The ether and spirit retained by the chloride of calcium, and by the residue of each distillation, may be recovered by distilling, and used in a subsequent operation,

When sulphuric acid and alcohol are mixed, it is usually considered that sulphethylic acid becomes formed, $C_4H_6O_2 + 2\,SO_3, HO = C_4H_5O, 2\,SO_3$. The next stage is the separation of this into ether, which distils over, and the liberation of sulphuric acid to renew the process until it becomes too weak for a successful result, fresh spirit being continuously added to replace that which distils off. A temperature between 260° and 310° answers best, with rapid ebullition; at a lower point much unchanged alcohol comes over, and with stronger heat olefiant gas is generated with variable quanties of other products. According to Mitscherlich and Berzelius, the formation of ether is an instance of *decomposition by contact*, alcohol at certain temperatures, on mere contact with sulphuric acid, being resolved into ether and water, the generation of sulphethylic (or sulphovinic) acid not being necessary for its production.

To purify it from water, alcohol, and sulphurous acid, it is redistilled after agitation with quick lime and chloride of calcium, so long as the specific gravity does not exceed 0·735.

ADULTERATIONS.—An excess of spirit of wine, or small quantities of water, increase its density. Fifty measures of ether, agitated with an equal volume of water, are reduced to forty-one by an absorption of eighteen per cent.,—any loss over this denotes impurity.

EFFECTS.—Ether is a powerful diffusible stimulant; it is prescribed to allay spasm, for flatulent colic, the pain attending the passage of gall-stones, nervous affections, as headach, or faintness, and during attacks of spasmodic asthma; in the latter stages of fever, it is used to relieve subsultus and hiccup, and given, in addition to wine and ammonia, when stimulation is necessary. Applied externally, if prevented from evaporating, it operates as a powerful rubefacient, and may be employed to relieve rheumatic and neuralgic pains; when allowed to escape, it causes considerable cold, acting as a refrigerant in headach, diseases of the brain, recent sprains and injuries, &c., for which purpose it is added to some cooling lotion.

The inhalation of a few drops of ether on sugar is recommended to relieve the irritation caused by respiring chlorine gas, and for spasmodic dyspnœa. If inspired more freely, mixed with air which has passed through a thin stratum of ether, it induces anæsthesia, under which surgical operations can be performed similar to chloroform; but is seldom administered, its vapour being more unpleasant, the insensibility less rapidly induced, and at the same time it is equally or more liable than chloroform to cause dangerous accidents, in persons suffering from cardiac or other organic diseases.

Dose.—fʒss. to fʒj., given in some aromatic water; two grains of spermaceti will perfectly incorporate them. For external use, f℥ss. to f℥j. is added to an eight-ounce lotion.

PURE ETHER.—Has a sp. gr. not exceeding 0·720; it boils at 94·8°. It is used to test the purity of quinia, aconitia, and atropia, which dissolve in it.

Preparation.—Shake ether, Oij., with distilled water, Oj., and, after separation has taken place, decant the ether, and again shake it with distilled water, Oj.; decant again, and put the washed ether into a retort with recently burned lime, one-quarter ounce, perfectly dry chloride of calcium, ℥iv., and after digesting for twenty-four hours, distil with gentle heat.

The agitation with water removes any spirit, and the lime salts get rid of all traces of water.

SPIRITUS ÆTHERIS.—Spirit of Ether.—The addition of spirit renders the ether miscible with water; sp. gr. 0·809. Its dose is fʒj. to fʒij., mixed with some diluent.

Preparation.—Ether, f℥x.; rectified spirit, Oj. Mix.

SPIRITUS ÆTHERIS NITROSI.—Spirit of Nitrous Ether (C_4H_5O, NO_3, dissolved in rectified spirit).—This fluid, commonly termed sweet spirit of nitre, is transparent, of a slight yellow tinge; volatile, and inflammable, of peculiar fragrant, apple-like odour, and sweetish acidulous taste, soluble in rectified spirit and water; sp. gr. 0·843.

Preparation.—Introduce nitrite of soda ℥v., into a matrass connected with a condenser; pour on it rectified spirit, Oij., previously mixed with sulphuric acid, f℥iv., and distil f℥xxxv., the receiver being kept very cool.

Nitrous acid set free from the nitrite of soda combines with some ether formed during the distillation of the spirit of wine and sulphuric acid, much of the spirit coming over unchanged.

Test.—The presence of nitrous acid is shown by agitating with solution of sulphate of iron, and a few drops of sulphuric acid, which strikes a deep olive-brown, or black colour.

Purity.—By keeping, it is liable to become acid, disengaging acetic and nitrogen acids; it should effervesce slightly, or not at all, with bicarbonate of soda. Few drugs are more habitually adulterated: alcohol and water are often mixed with it; it is also largely prepared from methylated spirit, which gives it an unpleasant smell, and contaminates it with a little nitrate of methyl; if aldehyd is present, it imparts a pungent odour and acrid flavour, and produces on the addition of potash a brown resinous compound, colouring the solution deeply when in any quantity. When agitated with two volumes of a saturated solution of chloride of calcium, one and a half per cent. by volume of nitrous ether should separate, and rise to the surface.

Effects.—The protracted inhalation of sweet spirit of nitre causes leaden purple discoloration of the hands, face, and lips, with extreme muscular debility, lasting for hours; and has at least in one instance terminated fatally. Taken internally in moderate doses, it is considered stimulant, added to expectorants, as senega, or combined with ammonia, in the same cases for which ether is prescribed. Given with diuretics, it promotes the secretion of the kidneys. Professor Christison has found it most useful for those dropsical effusions connected with diseased heart, and of least service in renal affections; it answers tolerably well in cases of pulmonary œdema. In union with sudorifics it promotes diaphoresis in febrile affections and recent colds; its alleged anodyne properties, if any, must be slight.

Dose.—fʒss. to fʒij., usually combined with other remedies.

AMYLIC ALCOHOL, or Fousel Oil ($C_{10}H_{11}O + HO$).—Hydrate of oxide of amyl, or oil of potato spirit, is a frequent impurity in spirits distilled from fermented potatoes, barley, or grain; being much less volatile than alcohol, it accumulates in the last portions of the liquid, and is procured by continuing the distillation after all the pure spirit is drawn off; the light fluid thus obtained requires to be redistilled, and the oily material collected for use; it is colourless, having a persistent offensive odour, and peculiar acrid taste; sp. gr. 0·818; its vapour is very irritating if respired; it dissolves in alcohol or ether; is sparingly soluble in water; boils at 270°, and burns with difficulty, having a bluish flame; acted on by powerful oxidizing agents, it forms valerianic acid.

Used—For preparing valerianic acid.

VALERIANATE OF SODA ($NaO, C_{10}H_9O_3$).—Is obtained in white dry masses, without alkaline reaction; soluble in rectified spirit, and giving off a powerful odour of valerian on the addition of dilute sulphuric acid; it deliquesces in moist air.

Valerianic Acid—Is a limpid colourless oil, smelling strongly of valerian root, and having a burning taste; it boils at 347°, and can be distilled unchanged.

Uses.—For preparing valerianate of zinc.

Preparation.—Mix sulphuric acid, f℥viss.; distilled water, f℥x.; dissolve bichromate of potash, ℥ix. in the remainder of half a gallon of distilled water (less the f℥x.) with the aid of heat; when both liquids are cold, mix them with fousel oil, f℥iv. in a matrass, with occasional brisk agitation until the temperature of the mixture falls to about 90°; connect the matrass with a condenser, and distil off about half a gallon of fluid; saturate this accurately with solution of soda; remove any oil which floats on the surface; evaporate until watery vapours cease to escape, and raise the heat cautiously to liquefy the salt. When the product has cooled and solidified, break in pieces, and place immediately in a stoppered bottle.

By oxidation amylic alcohol is converted into valerianic acid, $C_{10}H_{12}O_2 + 4\,O = C_{10}H_9O_3, HO + 2$ Aqua. The oxidizing agent employed is bichromate of potash, which with sulphuric acid forms chrome alum and nascent oxygen, that unites with the fousel oil, $KO, 2CrO_3 + 4\,SO_3 = KO, SO_3 + Cr_2O_3, 3\,SO_3$, and O_3; the valerianic acid passes over on distilling with valerianate of amyl, $C_{10}H_{11}O, C_{10}H_9O_3$—the latter yielding the drops of oil, that become apparent on saturating with soda.

ACIDUM ACETICUM GLACIALE.—Glacial Acetic Acid ($C_4H_3O_3$, HO).—A colourless pungent liquid, of strong acetous odour; when cooled to 32°, crystallizing in colourless plates; it boils at 243°, and can be distilled unchanged; its sp. gr. is 1·065, which increases on dilution until it contains 3 HO, when it becomes 1·079, its point of maximum density.

Preparation.—Place acetate of soda, ℥xx., in a porcelain basin on a moderately warm sand bath; apply heat until it liquefies, and continuing it stir till the salt becomes pulverulent; now raise the heat to cause fusion, and instantly remove the salt from the fire; when cool, break the mass, and place it in a stoppered retort which will hold Oiij., and connect with a Liebig's condenser; pour sulphuric acid, f℥viij., on the salt, quickly replace the stopper, and when the distillation of the acetic acid commences, continue it with the aid of heat, till f℥vj. pass over. Mix ʒj. of the acetic acid thus got with fʒj. of solution of iodate of potash, previously mixed with a little mucilage of starch; and if it causes a blue coloration, agitate the whole product of distillation with a quarter of an ounce of black oxide of manganese, perfectly dry and in fine powder, and redistil.

In fusing acetate of soda to render it anhydrous, the heat must be carefully regulated, to prevent the formation of acetone, $2\,C_4H_3O_3 = 2CO_2 + C_6H_6O_2$. The dry salt distilled with sulphuric acid affords monohydrated acetic acid and bisulphate of soda; thus, $NaO, C_4H_3O_3 + 2\,SO_3HO = C_4H_3O_3HO + NaO, HO, 2\,SO_3$; usually some traces of sulphurous acid are disengaged, which set iodine free from iodic acid, and give a blue colour to starch; they are removed by agitating with binoxide of manganese, and redistilling, $SO_2 + MnO_2 = MnO, SO_3$.

Purity.—Its freedom from sulphurous or nitric acids is tested by iodic acid and some starch; it should not give a blue coloration; when of full strength, fʒj. requires for saturation ninety-seven measures of the volumetric soda solution.

Tests.—All acetates heated with sulphuric acid, evolve a pungent odour of acetic acid; and in cold solutions, subnitrate of mercury forms a white crystalline precipitate of subacetate of mercury.

Effects.—This acid is employed to prepare aromatic vinegar, by dissolving in it camphor and essential oils; when applied locally, it is a rubefacient or vesicant, according to the length of time it is used; it may be painted to the skin as a substitute for cantharides when speedy blistering is desired, and is sometimes of service in porrigo decalvans, favus, and other obstinate cutaneous eruptions, particularly those depending on parasitic vegetations; if taken internally, it will act as a violent irritant, causing symptoms similar to the mineral acids, and requiring the same treatment.

ACIDUM ACETICUM.—Acetic Acid (Obtained by the destructive distillation of wood, and containing twenty-eight per cent. of anhydrous acetic acid).—Pyroligneous acid, or wood vinegar, is similar in its properties to glacial acetic acid, but more dilute; its sp. gr. 1·044 is not sufficient to determine its strength; f℥j. requires for neutralization 31·5 measures of the volumetric solution of soda.

Preparation.—This acid is obtained by distilling such descriptions of wood as are free from turpentine in iron vessels; the heat is gradually increased, until toward the end it approaches incipient redness; aqueous vapour first passes off; the ligneous tissue then decomposes, yielding more water, pyroxylic spirit, and the acetic acid which distils over; subsequently tarry and empyreumatic oily products form, and towards the termination of the process, carbonic oxide, carbonic acid, and olefiant gas escape, whilst charcoal remains in the retort. The impure pyroligneous acid is saturated with lime, by which much of the tarry matter is precipitated, and the naphtha or pyroxylic spirit separated by distilling; the pyrolignite of lime, mixed with sulphate of soda, is changed into sulphate of lime, which is insoluble, and acetate of soda, that is dissolved out and purified by repeated crystallizings and fusion; from this, by distilling with sulphuric acid, the concentrated pyroligneous acid comes off.

The formation of acetic acid from woody fibre may be explained by supposing lignin deprived of water—thus, $C_{12}H_{11}O_{11} = 2\,HO + 3\,C_4H_3O_3$.

Impurities.—It is liable to contain tarry matters and empyreumatic products, giving it an unpleasant odour or taste when neutralized with an alkali; this impure acid is unfit for medical purposes. The fraudulent addition of sulphuric or hydrochloric acid is tested by chloride of barium and nitrate of silver, which give no precipitate with genuine acetic acid; those acids, and also nitrous and sulphurous acids, are further tested by adding an equal volume of solution of iodate of potash and a little starch, which should remain free from blue coloration; lastly, any metallic contamination will be shown by sulphuretted hydrogen.

Used—To prepare dilute acetic acid, acetated solution of ammonia, oxymel, and the officinal acetates.

OXYMEL.—A pleasant addition to gargles and expectorant mixtures.

Dose.—f℥ss. to f℥j.

Preparation.—Liquefy clarified honey, ℥xl., by heat, and mix with acetic acid, f℥v.; distilled water, f℥v.

ACIDUM ACETICUM DILUTUM.—Dilute Acetic Acid (Containing 3·65 per cent. of real acid).—This is in ordinary use as a substitute for wine vinegar; its strength is ascertained by its sp. gr., 1·006, and by each f℥j. requiring for saturation thirty-one measures of the volumetric solution of soda.

Preparation.—Acetic acid, Oj.; distilled water, Ovij. Mix.

ACETUM.—Vinegar.—Is restricted to the impure dilute acetous product from French wines. The vinegar of commerce is obtained in great part from malt; or it consists of dilute pyroligneous acid, flavoured with acetic ether; wine vinegar has a straw colour, and acetous odour; with slight excess of ammonia it becomes slightly turbid, and of a purplish tint; sp. gr. ranging from 1·008 to 1·022. Wine is gradually converted into vinegar by exposing it to the action of the atmosphere, adding a little old vinegar to commence the process; it requires moderate temperature and peculiar manipulation to obtain a favourable result; theoretically, the change may be represented by the oxidation of alcohol, $C_4H_6O_2$, which passes through the intermediate stage of aldehyd, $C_4H_4O_2$, into acetic acid, $C_4H_3O_3$, HO, from the abstraction of its hydrogen.

Purity.—Chloride of barium and oxalate of ammonia should scarcely affect it, from the presence of slight traces of sulphates and lime salts; being free from metallic contamination, it is unaltered by sulphuretted hydrogen. Vinegar easily decomposes by the growth of vegetable mould in it, and is liable to contain minute animalcules, the vibrio aceti, or vinegar eel, which are best destroyed by heating it nearly to boiling.

CEREVISIÆ FERMENTUM.—Beer Yeast.—Is produced by the decomposition of gluten during the fermentation of beer; it is a light greyish-yellow soft substance, which readily putrefies; under the microscope it consists of numerous round or oval confervoid cells, that propagate by rapid gemmation.

Uses.—To prepare the cataplasm.—It has been administered internally in typhus fever as a tonic; and for tympanitic distention of the bowels used in enema with assafœtida.

CATAPLASMA FERMENTI.—Yeast Poultice.—Applied as a gentle stimulant to foul and gangrenous ulcers, to allay pain, and promote the separation of sloughs.

Preparation.—Beer yeast, f℥vj.; water heated to 100°, f℥vj. Mix, and add flour, ℥xiv. Place the mass near the fire till it rises.

CREASOTUM.—Creasote ($C_{16}H_{10}O_2$?).—A colourless oily liquid, of high refractive power, caustic taste, and strong tar-like odour, burning when ignited with much smoke; it is sparingly soluble in water, but freely dissolves in alcohol, acetic acid, ether, and glycerine; it instantly coagulates albumen; sp. gr. 1·065; its boiling point is 398°.

Preparation.—The heavy oils which are distilled from wood tar are treated with potash, which dissolves creasote, separating several hydrocarbons; after boiling, to purify it still further, and cooling, dilute sulphuric acid is added, and sets free the creasote; this process is repeatedly employed, until a colourless fluid results, which is digested with chloride of calcium, and redistilled.

Purity.—Much of the creasote of commerce is carbolic or phenic acid; it should remain unaffected with light; dropped on filtering paper, and heated to 212°, it evaporates, leaving no stain; a slip of deal dipped in it and afterwards in hydrochloric acid and dried in the air, acquires a greenish-blue colour.

Effects.—Over-doses are poisonous, combining with the tissues; causing giddiness, depressing the heart's action, and inducing convulsions and coma; f℥ij. have proved fatal within thirty-six hours after being taken.

Medical doses are prescribed to relieve the nausea and sympathetic vomiting of pregnancy; for sea sickness, in which it has also been strongly advised as a preventive; and for the distressing irritability of stomach attending chronic renal diseases; but it is considered of little benefit in inflammatory and structural changes, as cancer, or acute gastritis; it has been occasionally employed with advantage internally in cases of diabetes. In an undiluted state it is escharotic; painted over scrofulous, indolent, and lupoid ulcers, it destroys the diseased surface, and promotes granulation; and its antiseptic properties render it valuable in gangrenous and sloughing sores; in toothache depending on caries, it often relieves the pain, applied on a pellet of cotton to the decayed part—a little morphia may be mixed with it when the pain is severe. Creasote ointment is a useful dressing for bed sores and deep burns, attended with excessive suppuration, to increase the formation of new tissue; it is also employed in cutaneous diseases in the same manner as tar ointment, particularly for the scaly eruptions, psoriasis, &c.; a glycerine solution of creasote is a cleanly and useful substitute for the ointment, which can be made of any required strength; dissolved in water (of which eighty parts will take up one of creasote), it is used as a wash to foul sores, ozœna, and caries; a gargle in phagedenic and putrid conditions of the throat; or for a vaginal injection in cancerous affections of the womb.

Dose.—For internal use, half a drop to two drops, are given in pill or solution—it is readily suspended by a little liquorice powder; for lotions, ten to twenty drops are added to water, Oj.; care should be taken to have it thoroughly dissolved.

Antidotes.—Albumen, with mucilaginous drinks; emetics should be used as soon as possible.

MISTURA CREASOTI.—**Creasote Mixture.**—Is given internally in doses of f℥ss. to f℥j.; the acetic acid is considered to render the creasote soluble in water.

Preparation.—Creasote, glacial acetic acid, of each sixteen minims. Mix. Gradually add distilled water, fʒxv.; and lastly, syrup, f℥j.; spirit of juniper, fʒss.

UNGUENTUM CREASOTI.—**Creasote Ointment.**—Applied to burns, ulcers, and bed sores, to promote granulation.

Preparation.—Creasote, fʒj.; simple ointment, ℥j. Mix.

CARBOLIC OR PHENIC ACID $(C_{12}H_5O, HO)$.—The hydrate of phenyl is not officinal; much of the creasote of commerce consists of this substance, which resembles genuine creasote in its properties—in fact, they appear to be closely related in their chemical and physical characters. Pure carbolic acid is crystalline at ordinary temperatures, becoming liquid with a minute trace of moisture; at 95° it fuses, and passes into vapour at 370°; when a splinter of deal is placed in it, and afterwards in hydrochloric acid, it becomes blue on drying.

It is procured during the distillation of coal, by collecting those portions of the oil which boil between 300° and 400°; on mixing this with hydrate of potash, a white crystalline substance separates, which, dissolved in water, deposits a heavy layer, containing phenate of potash; the addition of hydrochloric acid sets free carbolic acid, which is afterwards purified and redistilled.

Effects.—It is given internally in the same doses as creasote, and applied topically for disinfecting and deodorizing purposes; a lotion composed of carbolic acid dissolved in acetic acid, and added to from forty to eighty parts of water, is recommended for dressing fœtid sores; and Mr. Turner, of Manchester advises, for the same object, carbolic acid, fʒij.; solution of potash, fʒj.; water, f℥viij.

VOLUMETRIC ANALYSIS.

The convenience of the volumetric method of analysis is so great, in all cases where it is desirable to determine any one important constituent of a chemical compound with accuracy and rapidity, that its adoption in the Pharmacopœia might be expected. It consists essentially in the preparation of solutions of known strength, and the indirect calculation of the amount of any chemical substance present, by the quantity of the reagent exactly requisite to effect some obvious chemical change. Thus we have examples of

SATURATION ANALYSES—In which a previously-made volumetric solution of oxalic acid is used to determine the strength of alkaline preparations; or solutions of the mineral or vegetable acids are tested by employing the volumetric solution of soda. The point at which neutralization takes place is shown by the use of litmus.

OXIDATION and REDUCTION ANALYSES.—Of this class, the bichromate of potash solution affords us an illustration, being employed to convert protosalts of iron into persalts; or the volumetric solution of iodine, directed for testing arsenious acid; the hyposulphite of soda solution, which estimates the presence of free iodine, likewise belongs to this subdivision.

PRECIPITATION ANALYSES.—In this group a manifest precipitation attends the accomplishment of the chemical process; thus the volumetric solution of nitrate of silver is employed for determining the strength of solutions containing hydrocyanic acid.

The apparatus we require for ordinary volumetric purposes are correctly graduated glass measures; burettes; a delicate balance, with weights; some glass bottles, with good glass stoppers, for preserving the solutions; and pipettes, which are of service for delivering small quantities of liquid with neatness and accuracy.

BURETTES are glass tubes, graduated according to definite scales; different modifications and patterns have been contrived to combine accuracy and strength, with reasonable cheapness. Fig. 1 is a burette of the simplest description; it is little liable to fracture; but the escape of liquid from the delivery tube is difficult to regulate, when the hand becomes tired or tremulous; and whilst pouring out the last portions of its contents, it is liable to flow in irregular waves.

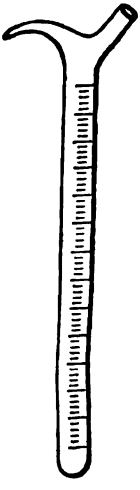

FIG. 1.

Mohr's well-known apparatus, Fig. 2, is applicable to all purposes in which contact with vulcanized India rubber is not prejudicial to the liquid it is intended to contain, a difficulty which prevents its being used with permanganate of potash; but this, though much employed in chemical laboratories, is not included amongst the officinal volumetric solutions. It consists of a graduated tube of glass, drawn out to a fine point at one extremity; upon this is accurately fitted a piece of vulcanized India rubber tubing, terminating beneath in a small glass mouth-piece, or tube, that is inserted into its free end, through which the contents of the burette are permitted to escape from time to time in any quantity, or the tube can be perfectly closed by the pressure of a brass spring or pinch cock; glass stop-cocks have been tried for this purpose, but are seldom air-tight, and difficult to keep free from dirt. The upper part of the burette is lightly closed with a cork, through which passes a fine tube for admitting air; and the entire apparatus is firmly fixed in a vertical position in a retort stand, so that the graduations on the tube are easily read off, without the liquid being disturbed or agitated.

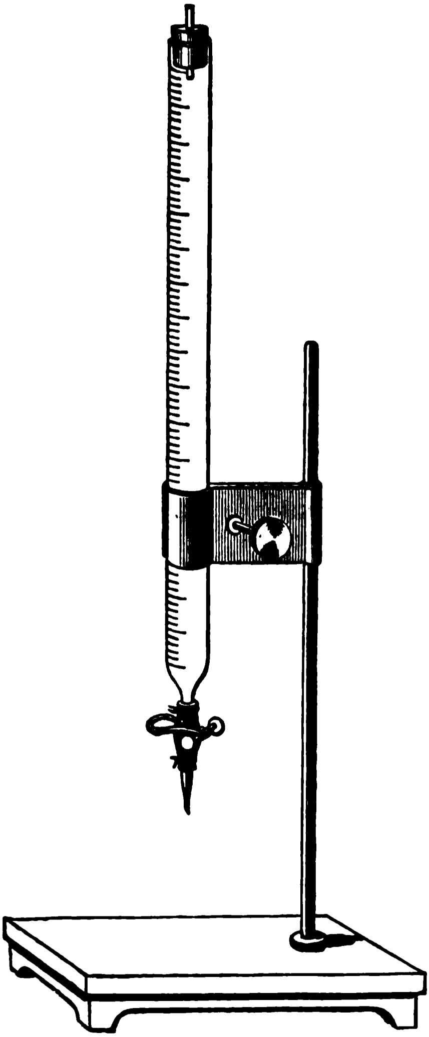

FIG. 2.

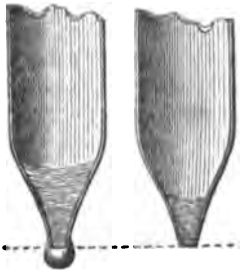

FIG. 3. FIG. 4.

PIPETTES are tubes of less size, graduated in the same manner as the burette, and intended for measuring small quantities of solutions; or they have only one mark on the neck, indicating the amount they are capable of containing when full, if designed for delivering definite portions of liquid; in lifting them they are closed air tight, by firm pressure of the finger at the top. When purchasing pipettes, it is necessary to ascertain the principle on which they have been graduated; some kinds, as Fig. 3, require to be "cleared by breathing" through them to expel the last drops of fluid; others discharge themselves by "free flow," and do not need this proceeding; or, again, like Fig. 4, the liquid escapes, leaving a certain residue in "contact with glass," which has been previously allowed for in the process of graduating.

Volumetric solutions before being used should be shaken, in order that they may be throughout of uniform strength. They should always be preserved in stoppered bottles.

The burette, or alkalimeter, used with these solutions for pharmacopœial purposes, when filled to 0°, holds 1000 grains of distilled water at 60°, and is divided into 100 parts of equal capacity.

TEST SOLUTIONS.

VOLUMETRIC SOLUTION OF BICHROMATE OF POTASH ($KO, 2\,CrO_3 = 147{\cdot}5$).—The quantity of this solution which fills the volumetric tube to 0°, contains one-tenth of an equivalent in grains of bichromate of potash, and when added to a solution of protosalt of iron acidulated with hydrochloric acid, is capable of converting one-tenth of six equivalents of iron (16·8 grains) from the state of protosalt to that of persalt.

In practising this process, it is known that the whole of the protosalt has been converted into a persalt when a minute drop of the solution, placed in contact with a drop of the solution of ferridcyanide of potassium on a white plate, ceases to strike with it a blue colour.

It is employed in testing the quantity of protosalt of iron present in the arseniate, saccharated carbonate, and magnetic oxide. The reaction that occurs will be $KO, 2\,CrO_3 + 7\,HCl = KCl + Cr_2Cl_3 + 7\,HO + 3\,Cl$; the chlorine reacting on $3\,HO = 3\,HCl + 3\,O$, which peroxidizes the iron thus, $6\,FeO + 3\,O = 3\,Fe_2O_3$.

PREPARATION.—Pure bichromate of potash, 129 grains; distilled water, Oj. Dissolve.

VOLUMETRIC SOLUTION OF HYPOSULPHITE OF SODA ($NaO, S_2O_2 + 5\,HO = 124$).—This solution is used for estimating free iodine, an object which it accomplishes by forming with the iodine two colourless compounds—iodide of sodium and tetrathionate of soda, $2\,NaO, S_2O_2 + I = NaI + NaO, S_4O_5$. One hundred measures of it include one-tenth of two equivalents of the hyposulphite in grains, and therefore correspond to 12·7 grains of iodine, being one-tenth of its equivalent.

Preparation.—Dissolve hyposulphite of soda in crystals, 260 grains, in one pint of distilled water, and drop the solution cautiously from the volumetric tube into one hundred measures of the volumetric solution of iodine until the brown colour of the iodine is just discharged; note the number of measures (N) required to produce this effect; and having then taken f℥xvi. of the same solution, augment this quantity by the addition of distilled water until it amount to $\frac{1600}{N}$ fluid ounces. If, for example, N = 96, the sixteen ounces of the solution of hyposulphite of soda should be diluted with distilled water so as to become $\frac{1600}{96}$ = 16·66 fluid ounces.

VOLUMETRIC SOLUTION OF IODINE (I = 127).—This solution may be employed for determining the amount of sulphuretted hydrogen, or of a metallic sulphuret, in a fluid, but is chiefly used for the estimation of sulphurous and arsenious acids. It is dropped from the volumetric tube into the liquid to be tested, until free iodine begins to appear in the solution, which will strike a blue colour with cold mucilage of starch; 100 volumetric measures of it include 12·7 grains (one-tenth of an equivalent) of iodine, and therefore correspond to 1·7 grains of sulphuretted hydrogen, 3·2 grains of sulphurous, and 4·95 grains of arsenious acid. The reactions that ensue with these substances and solution of iodine are, with sulphuretted hydrogen, $HS + I = HI + S$; with sulphurous acid, $SO_2 + I + HO = HI + SO_3$; and with arsenious acid, $AsO_3 + 2\,I + 2\,HO = 2\,HI + AsO_5$.

Preparation.—Mix iodide of potassium, 150 grains; pure iodine, in powder, 111·125 grains, in a bottle with distilled water, f℥xviij.; agitate until both are dissolved; and when the solution is complete, add as much more distilled water as will make the total bulk exactly one pint.

VOLUMETRIC SOLUTION OF NITRATE OF SILVER ($AgO, NO_5 = 170$).—The quantity of this solution which fills the volumetric tube to 0°, includes seventeen grains of nitrate of silver, or one-tenth of an equivalent of the salt in grains. Upon dropping it into dilute hydrocyanic acid, rendered alkaline by soda, the precipitate first formed is, upon agitation, redissolved, and continues to be so until the whole of the cyanogen of the acid has united with the sodium and silver, forming the double cyanide, $AgCy + NaCy$. So soon as a permanent precipitate appears, the quantity of solution used is calculated, 100 volumetric measures corresponding with 5·4 grains of absolute hydrocyanic acid.

Preparation.—Nitrate of silver, 148·75 grains; distilled water, Oj. Dissolve, and keep in an opaque stoppered bottle.

VOLUMETRIC SOLUTION OF OXALIC ACID ($HO, C_2O_3 + 2\,HO = 63$).—Mohr has adopted oxalic acid as the base of his volumetric system for determining alkalies; its advantages are, it is easily obtained in a state of purity by recrystallization; its composition is perfectly definite, as it is not liable to change by deliquescing, and is quite fixed in heated solutions. The quantity of the volumetric solution which fills the tube to 0°, includes exactly sixty-three grains of crystallized oxalic acid, and is therefore capable of neutralizing an equivalent in grains of any alkali or alkaline carbonate.

PREPARATION.—Purified oxalic acid in crystals, quite dry, but not effloresced, 551·25 grains; dissolve in distilled water, f℥xviij., and when the solution is complete, add as much distilled water as will make the bulk exactly f℥xx. at 60°.

VOLUMETRIC SOLUTION OF SODA ($NaO = 31$).—The quantity of this solution which fills the volumetric tube to 0°, includes thirty-one grains of soda, and will therefore neutralize an equivalent in grains of any monobasic acid. The dilute mineral acids are of such strength that fʒvj. of dilute sulphuric, nitric, or muriatic acid are saturated by this quantity of alkali.

PREPARATION.—Fill the volumetric tube to 0° with solution of soda, and drop this into gr. lxiij. of purified oxalic acid, dissolved in distilled water, f℥ij., until the acid is exactly neutralized, as indicated by litmus; note the number of measures (N) of the solution used; and then having taken forty fluid ounces of the solution of soda, augment this quantity by the addition of distilled water until it becomes $\frac{4000}{N}$ fluid ounces. If, for example, $N = 93$, the forty ounces of solution of soda should be diluted so as to become $\frac{4000}{93} = 43{\cdot}01$ fluid ounces.

The strength of the solution of soda being unknown, and liable to variation, it is necessary, in the first place, to determine how much of it represents an atom of soda; this is accomplished by finding the quantity which exactly neutralizes sixty-three grains, or an atom, of oxalic acid dissolved in any convenient bulk of water (two ounces are directed); this amount of soda solution is designated N, and should be made up with distilled water to fill the test tube to 0°. It is so troublesome to make corrections for strength with each fresh experiment, that forty fluid ounces of soda solution are taken, diluted with the proper quantity of water, and laid by for use. The calculation is a simple rule of three sum: ninety-three measures have, for instance, been ascertained to represent 100 volumetric divisions, to what extent will 40 ounces require dilution? $93 : 100 :: 40 : 43{\cdot}01$; or, written in a fractional form, $\frac{4000}{93} = 43{\cdot}01$, being the quantity the soda solution should measure to make a standard solution.

ELEMENTS OF MATERIA MEDICA.

PART II.

VEGETABLE MATERIA MEDICA.

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VEGETABLE MATERIA MEDICA.

The arrangement adopted will consist of the following Classes or Subdivisions of the Vegetable Kingdom:—

EXOGENS.—Plants with distinct bark, wood, and pith; the wood increasing by yearly additions to its exterior; leaves reticulated; flowers usually in quinary or quaternary arrangement, and embryo dicotyledonous.

ENDOGENS.—Stem increasing by endogenous growth, having no distinct pith or bark; leaves parallel veined; flowers glumiferous, or arranged in ternary order; embryo monocotyledonous.

ACROGENS.—Cryptogamic plants, with distinct stem, containing vascular tissue; leaves with forked venation.

THALLOGENS.—Cellular cryptogamic plants.

SUB-CLASSES OF EXOGENS.

THALAMIFLORÆ.—Flowers usually dichlamydeous; stamens hypogynous; containing the following orders:—

Ranunculaceæ,
Magnoliaceæ,
Menispermaceæ,
Papaveraceæ,
Cruciferæ,
Polygalaceæ,
Krameriaceæ,
Malvaceæ,
Aurantiaceæ,
Guttiferæ,
Vitaceæ,
Linaceæ,
Zygophyllaceæ,
Rutaceæ,
Simarubaceæ.

Calycifloræ.—Flowers dichlamydeous; petals distinct or united; stamens perigynous or epigynous; containing—

Anacardiaceæ,
Amyridaceæ,
Leguminosæ,
Rosaceæ,
Myrtaceæ,
Granateæ,
Cucurbitaceæ,
Umbelliferæ,
Caprifoliaceæ,
Cinchonaceæ,
Valerianaceæ,
Compositæ,
Lobeliaceæ,
Styraceæ.

Corollifloræ.—Flowers dichlamydeous; petals united; stamens rising from the receptacle or corolla; containing—

Ericaceæ,
Oleaceæ,
Asclepiadaceæ,
Loganiaceæ,
Gentianaceæ,
Convolvulaceæ,
Solanaceæ,
Atropaceæ,
Scrofularineæ,
Labiatæ.

Monochlamydeæ.—Flowers with a calyx, or achlamydeous; ovules in a pericarp; containing—

Polygonaceæ,
Thymelæaceæ,
Myristicaceæ,
Lauraceæ,
Aristolochiaceæ,
Euphorbiaceæ,
Piperaceæ,
Urticaceæ,
Cupuliferæ.

Gymnospermeæ.—Similar to the last, but the ovules not within a true pericarp; containing—

Coniferæ.

SUB-CLASSES OF ENDOGENS.

Dictyogens.—Plants with reticulated venation; leaves usually disarticulating; woody matter of rhizome disposed in circular, wedge-like form; including—

Smilaceæ.

Petaloideæ.—Flowers with a coloured perianth, or whorled scales—

Scitamineæ,
Irideæ,
Marantaceæ,
Liliaceæ,
Melanthaceæ.

Glumales.—Flowers composed of imbricated bracts—

Gramineæ.

ACROGENS, . . . Filices.

THALLOGENS, $\begin{cases}\text{Lichens,}\\\text{Algæ.}\end{cases}$

THALAMIFLORAL EXOGENS.

Ranunculaceæ.—Herbs, rarely shrubs; leaves palmate or digitate, petioles dilated; sepals three to five; petals three to fifteen, often deformed; stamens indefinite, with adnate anthers; fruit achenes or follicles; seeds with minute embryo and horny albumen.

ACONITUM NAPELLUS.—Monk's Hood, or Purple Rocket, is a native of the mountainous districts of Central Europe, and cultivated in our gardens; its roots, which have often been mistaken for horse-radish with fatal results, are officinal; they are imported from Germany, or gathered in Britain in early spring, before the leaves appear; they vary in length, from one to three inches; are not thicker than the finger at the crown, tapering, wrinkled and brown externally, with a heavy earthy odour, tasting bitter, and producing prolonged tingling and numbness of the lips and mouth. The fresh leaves and flowering tops, collected when about one-third of the flowers are expanded, are also used for preparing an extract. Its activity depends on the presence of aconitine—afterwards described, which exists, combined with aconitic acid; and Messrs. Smith, of Edinburgh, have recently obtained another crystalline principle—aconella, remarkable for its close similarity to narcotine, which it resembles in its chemical relations, and reacts in the same manner with polarized light.

Botany.—A perennial herb, with annual simple stems, two to six feet high; leaves smooth, palmate, divided into five deeply cut, wedge-shaped segments; flowers blue, in a loose spike; calyx irregular, the upper sepal helmeted, enclosing two staminoid petals; carpels three.

Effects.—Aconite must be considered one of our most virulent poisons. It causes peculiar numbness, burning in the mouth and stomach, and tingling extending over the body, continuing for hours, should the patient survive; there are also repeated efforts at vomiting, vertigo, dimness of vision, with muscular debility and general prostration; the pupil is usually in a contracted state, and, according to Dr. Fleming's observations, death may result either from its powerful sedative effects, or from paralysis of the respiratory muscles, inducing asphyxia; or, should the attack not prove rapidly fatal, it is liable to bring on syncope, from sudden failure of the heart's action; this result is most to be dreaded, as aconite operates directly upon the circulation; it will destroy life within a short time—from half an hour to eight hours being the average period within which it kills.

Prescribed internally in medical doses it requires extreme care; it may be tried in obstinate neuralgic and rheumatic affections, for which Dr. Lombard and others consider it almost specific, or for relieving the distressing pain of internal aneurismal tumors. I have employed it in some cases of gastrodynia, but without perceiving much benefit from it; used locally, its property of paralyzing the sensitive nerves has led to its being largely tried in neuralgia, particularly tic doloroux; it seldom fails to alleviate, and will often cure the attack, succeeding best where there is no organic cause for its continuance, such as disease of the teeth. Pereira found it of service in the treatment of intercostal rheumatism; and it usually exerts a beneficial influence in obstinate prurigo and hypersensibility of the skin, and will relieve the pain and itching of unbroken chilblains.

Antidotes.—None known; tannin is advised, but cannot be depended on; the stomach should be thoroughly emptied as soon as possible, and stimulants, ammonia, strong coffee, and brandy freely exhibited.

EXTRACTUM ACONITI.—Extract of Aconite.—Is best suited for external use; applied in substance for painful neuralgic affections, or made into ointment; its strength is liable to vary; if given internally, the dose will be gr. j. to gr. ij., every six or eight hours, carefully watched.

Preparation.—Take of fresh leaves and flowering tops, lb. 112; bruise in a stone mortar and press out the juice; heat it gradually to 130°, and separate the green colouring matter by a calico filter; heat the strained liquid to 200°, to coagulate the albumen, and again filter; evaporate the filtrate by a water bath to the consistence of thin syrup; add the green colouring matter previously separated, and, stirring assiduously, evaporate at a heat not above 140°, until the extract is of proper consistence.

TINCTURA ACONITI.—Tincture of Aconite.—May be employed internally in rheumatic and other painful affections, in doses of ten to fifteen drops, every four or six hours, observing its effects; it should never be carried beyond producing tingling sensations in the arms, and lowering of the pulse to about sixty beats in the minute.

Preparation.—Macerate aconite root in fine powder for forty-eight hours with rectified spirit, f℥xv., in a close vessel, agitating occasionally; then transfer to a percolator, and, when the fluid ceases to pass, pour into the percolator f℥v. more of spirit; so soon as the percolation is completed, subject the contents of the percolator to pressure; filter the product; mix the liquids, and add sufficient rectified spirit to make one pint.

LINIMENTUM ACONITI.—Liniment of Aconite.—A concentrated preparation, which demands special caution in dispensing; as numerous accidents have occurred from persons accidentally taking liniments containing aconite. It is applied externally, painted over painful surfaces, or added to embrocations, and should never be employed when the surface is extensively abraded.

PREPARATION.—Aconite root in powder, ℥xx.; moisten with rectified spirit, and macerate for seven days; then percolate into a receiver containing camphor, ℥j., adding rectified spirit until the product amounts to one pint.

ACONITIA, OR ACONITINE ($C_{60}H_{47}NO_{14}$).—An intensely poisonous alkaloid; odourless, with bitter taste; difficult to crystallize, and usually in the form of white powder, which, rubbed on the skin, causes tingling and prolonged numbness; it dissolves in ether or alcohol, but requires fifty parts of hot, or 150 of cold water, for solution; reacts strongly alkaline, neutralizing acids, and is precipitated by caustic alkalies, but not by carbonate of ammonia or the bicarbonates of potash or soda; heated, it melts and burns with a smoky flame, leaving no residue.

PREPARATION.—Pour on aconite root in coarse powder, lb. xiv., rectified spirit, three gallons; mix well, and heat until ebullition commences, then cool, and macerate for four days; transfer the whole to a displacement apparatus, and percolate, adding more spirit until the root is exhausted; distil off the greater part of the spirit from the tincture, and evaporate the remainder over a water bath, until the whole of the alcohol has been dissipated; mix the residual extract thoroughly with twice its weight of boiling distilled water, and, when cooled to the temperature of the atmosphere, filter through paper; to the filtered liquid add solution of ammonia in slight excess, and heat them gently over a water bath, separate the precipitate on a filter, and dry it; reduce this to a coarse powder, and macerate it in successive portions of pure ether with frequent agitation. Decant the several products; mix, and distil off the ether until the extract is dry. Dissolve this in warm distilled water, acidulated with dilute sulphuric acid; and when the solution is cold, precipitate it by the cautious addition of solution of ammonia, diluted with four times its bulk of distilled water; wash the precipitate on a filter, with a small quantity of cold distilled water, and dry it, by slight pressure between folds of filtering paper.

This process, recommended by Dr. Headland, is rapid, and affords a good product; the alkaloid is extracted by the spirit of wine, which is removed in greater part by distilling; it is next dissolved out with water from much of the resinous and colouring principles, and precipitated in an impure state by ammonia, which removes the aconitic acid; it is next separated with ether, and on distilling this got as an extract, which, when dissolved in water, is converted into sulphate of aconitine, and the pure alkaloid precipitated by ammonia.

PURITY.—Much of the aconitine sold is worthless; it should dissolve perfectly in pure ether.

EFFECTS.—This substance is so poisonous, that Pereira states, "the fiftieth of a grain has endangered life;" it cannot be safely given internally; it is principally used dissolved in spirit, or in the form of ointment, for neuralgic affections. Accidents resulting from it require similar treatment to aconite.

UNGUENTUM ACONITÆ.—ACONITIA OINTMENT.— Acts most usefully in relieving the pain of tic doloroux and other nervous diseases, gently rubbed to the affected part; the numbness it causes will continue for several hours; it is rather expensive, which limits its use.

PREPARATION.—Aconitia, gr. viij.; rectified spirit, fʒss.; dissolve, and add prepared lard, ℥j. Mix thoroughly.

PODOPHYLLUM PELTATUM.—THE MAY APPLE.—Is a common plant in moist shady woods in the United States; the rhizome is used; it consists of pieces of variable length, about two lines thick, with swelling joints at short intervals; much wrinkled, and reddish-brown externally, whitish within, breaking with a short fracture, and having pale brown rootlets; its powder is brownish-yellow, with a sweetish odour, and bitterish, subacrid, and nauseous taste. Its effects are considered to resemble jalap; the active resinous principle, podophyllin, is officinal.

BOTANY.—Rhizome perennial, creeping for several feet; stem about a foot high, erect, dividing into two petioles, and supporting a solitary flower; each petiole bears a large peltate, palmately divided leaf; calyx of three deciduous sepals; petals six to nine, white and fragrant; fruit a large oval berry, when ripe lemon-yellow, containing a sweetish pulp, and about twelve ovate seeds.

PODOPHYLLI RESINA.—RESIN OF PODOPHYLLUM.—The root yields about three and a half per cent. of this substance, which requires further analysis; it appears to contain two resins—one of which dissolves in ether, and the muriate of berberine, a principle also got in calumba; like all resinoids, it is soluble in rectified spirit, and in ammonia, precipitating from the spirit on adding water, and from the ammonia by acids; its colour varies from pale yellowish-green to dark brown, the lighter coloured preparation being considered purest.

PREPARATION.—Podophyllum in coarse powder, lb. j.; rectified spirit, Oiij., or sufficient to exhaust the root by percolation; place the tincture in a still, and draw off the spirit; slowly pour the residue into three times its volume of distilled water, acidulated with $\frac{1}{24}$th its bulk of hydrochloric acid, constantly stirring; after standing for twenty-four hours, collect and wash the resin on a filter with distilled water, and dry it in a stove.

The water precipitates the resin, and hydrochloric acid converts the berberine into a muriate.

Purity.—It should be almost entirely soluble in pure ether.

Effects.—Given in full doses of two to five grains, podophyllin operates as a drastic cathartic; but, similar to all resinous purgatives, its action is uncertain. It is largely used in America, and is a recent addition to our list of drugs; the over-purging which results from its exhibition in excessive quantity is asserted to be best relieved by taking copious draughts of sour milk, the lactic acid which it contains acting as an antidote to its effects, apparently by preventing its solution in the alkaline secretions of the intestines. When prescribed in doses of a quarter to half a grain, it operates on the liver and bowels, producing free bilious discharges; it is liable to induce unpleasant griping or nausea, and in some persons will cause vomiting, resembling jalap resin in its medical properties; it is preferably given in combination with other remedies; thus, made into a pill with soap, the alkali renders it more soluble, and milder in its action; it is also recommended when used in powder, to be well triturated with sugar of milk, which subdivides its particles, and favours their absorption. It proves of special service in cases of jaundice and hepatic obstruction with sluggish condition of the liver, acting as an effectual cholagogue, and when necessary can be given with mercurials; its employment is contra-indicated where there is any gastro-intestinal irritation. In cases of irregular action of the bowels, and for those symptoms usually termed bilious derangement, when an active purgative is required, it is given with rhubarb, aloes, or some of the purgative pill masses; small doses are also alleged to have considerable influence in removing attacks of bronchitis, and catarrhal affections; some even claim for it all those alterative properties in regulating the secretions, which are usually attributed to the preparations of mercury.

Dose.—The fourth to half a grain, repeated every four hours, if necessary, as an aperient; two grains will usually purge severely. For young children the one-tenth or one-eighth of a grain, well triturated with sugar, will operate as a satisfactory purgative, and seldom disagrees.

Magnoliaceæ.—Trees or shrubs with coriaceous leaves and convolute stipules, which cover the buds, and are deciduous; flowers fragrant; sepals three to six; petals three or more, imbricate; stamens indefinite, with adnate anthers; carpels numerous, one-celled, on an elevated receptacle; embryo minute, in fleshy albumen.

ILLICIUM ANISATUM, or Star Anise.—Is an evergreen tree, growing in China and Japan; its fruit consists of five to ten brownish ligneous capsules, united in the form of a star, and containing each a brown shining seed; this yields a fragrant volatile oil, which is imported from China, and used for the same purposes as oil of anise, from which it is distinguished by not solidifying at 35°;

it consists of a hydrocarbon, isomeric with turpentine, and a crystalline solid, $C_{20}H_{12}O_2$.

MENISPERMACEÆ.—Trailing shrubs; leaves simple, entire; flowers, unisexual, often diœcious; stamens monadelphous or distinct; carpels on a gynophore, one-celled; fruit drupaceous, one-celled; embryo large, curved, in albumen.

ANAMIRTA COCCULUS, OR COCCULUS INDICUS PLANT.—Is a native of Malabar; its berries are employed; they are reniform, rather larger than a pea; wrinkled, and blackish-brown externally, containing a white, oily, bitter seed, which dries up on keeping so that the shells are often empty; if fit for medical use, the kernel is required to fill at least three-fourths of the cavity; it affords a non-nitrogenized neutral principle, picrotoxin, $C_{12}H_7O_5$; and an alkaloid, menispermin, $C_{18}H_{12}NO_2$, combined with cocculinic acid. Picrotoxin is crystalline, and intensely bitter, dissolving in alcohol or ether; in doses of five to ten grains it will poison large dogs, producing tetanic spasms, and complete inability to control their movements.

BOTANY.—A climbing shrub, with corky bark; leaves petiolate, thick, and shining; flowers diœcious, in racemes; fruit of one to three drupes, each one-seeded.

EFFECTS.—Large quantities are imported, for which there is no legitimate use; they are supposed to be added to beer to impart to it a factitious intoxicating strength; and when bruised the berries are used for destroying game and fish, which are said to become impregnated with the poisonous principle if they die slowly,—barbel being particularly liable to cause accidents if afterwards used for human food. In medicine it is employed in ointment for stimulating chronic eruptions, and to kill pediculi; it should not be applied to abraded surfaces.

UNGUENTUM COCCULI.—OINTMENT OF COCCULUS.—Recommended to destroy vermin; in cases of chronic eczema with slight secretion; and for scabies.

PREPARATION.—The seeds, gr. lxxx., beat in a mortar, and mix with prepared lard, ℥j.

COCCULUS PALMATUS.—THE CALUMBA PLANT.—A native of tropical Africa, which grows 5° north of Mosambique; according to Myers its true source is the *Jateorhiza Calumba;* the roots are dug in the hot season, and the offsets cut into transverse slices and dried in the shade; they form flat circular pieces from half an inch to three inches in diameter, and a quarter to half an inch thick; the cortical portion has a brownish cuticle; it is two or three lines broad; the inner part consists of three or four concentric rings, softer than the cortex, and shrinks by drying; it is pale yellow, has a faint odour, and powerfully bitter taste. Calumba is distinguished by having no tannin; it yields nearly one-third its weight of starch; with calumbin a neutral crystalline substance, composed of $C_{44}H_{22}O_{14}$, slightly soluble in water and spirit; calumbic acid, $C_{42}H_{21}O_{14}$; and an alkaloid berberin, $C_{40}H_{17}NO_8$; that forms soluble salts, and imparts a yellow hue to the root. When of good quality it should be hard, not worm-eaten, or of black colour; it is never adulterated, though a false calumba, the root of *Frasera Walteri*, is said to be imported from America, and sent to the Continent, which abounds in tannin, and affords little or no starch.

Botany.—A climbing diœcious plant, root perennial, with numerous fleshy tubers; stem annual, of soft texture, covered with hairs; leaves large, orbicular, five-lobed, with wavy edges and long foot stalks; racemes axillary—the male one eighteen inches long, giving off flexuose branchlets, seven to eight flowered; flowers sessile and glabrous; fruit a drupe; embryo imbedded in albumen.

Effects.—A valuable tonic, employed in diseases of debility; for flatulent dyspepsia, attended with loss of appetite, and nausea; and other cases where a mild bitter is indicated; its infusion forms a good vehicle for chalybeates, as it contains no tannin, and for the mineral acids; it is prescribed to allay irritability of stomach and vomiting, unconnected with gastric disease; for the sickness of pregnancy, bilious retching, and that caused by the passage of renal calculi, or persisting after the administration of emetics, and also proves of service for the emesis and diarrhœa of dentition. Calumba is sometimes used with advantage in chronic dysentery and diarrhœa when tonics are admissible, and is particularly adapted for persons of weak constitutions suffering from habitual relaxation of the bowels.

INFUSUM CALUMBÆ.—**Infusion of Calumba.**—Is prepared with cold water, to prevent the solution of the starch which abounds in the root; it keeps badly, soon spoiling in warm weather; the root would be better sliced, instead of powdering.

Dose.—f℥ss. to f℥j., three or four times a day.

Preparation.—Calumba, in coarse powder, ℥ss.; cold distilled water, f℥x.; macerate for one hour, and strain.

TINCTURA CALUMBÆ.—**Tincture of Calumba.**—

Used—For adding to the infusion of calumba or other tonic bitters.

Dose.—From fʒss. to fʒij.

Preparation.—Calumba, bruised, ℥ijss.; proof spirit, Oj.; prepare by macerating and percolation, similar to "tincture of aconite"—to yield one pint.

EXTRACTUM CALUMBÆ.—Extract of Calumba.—Prescribed in cases requiring tonic treatment, in doses of three to five grains; or used for making pill masses.

Preparation.—Calumba, in powder, lb. j.; proof spirit, Oij.; macerate for twenty-four hours; pack in a percolator, and slowly pass more proof spirit, Oij., through it; distil off the spirit, and evaporate the residue to proper consistence.

CISSAMPELOS PAREIRA, or Pareira Brava.—Is a plant indigenous to the tropics; it is found growing in all the districts of India, and imported for medical purposes from Brazil; the root is in irregular cylindrical portions, half an inch to four inches thick, and varying from a few inches to four feet long; externally it has a thin brown cortex, furrowed, and transversely wrinkled; the inside consists of irregularly disposed concentric rings, varying in number according to the age of the root, traversed by conspicuous medullary rays, and having numerous apertures of large-sized ducts; the wood is greyish, odourless, tasting at first sweetish, and afterwards unpleasant and bitter; its alleged active principle, cissampelin, is a hard, yellow, semitransparent substance, which rapidly oxidizes; very bitter, and reacting alkaline.

Botany.—A climbing plant, with numerous slender stems; leaves peltate, entire, downy beneath; flowers in racemes, diœcious, small. Males, sepals four, petals four, in a cup-shaped corolla; stamens monadelphous. Female calyx one-leaved; corolla none; styles three; berry scarlet, hispid, one-seeded.

Effects.—Pareira is prescribed to correct mucous discharges from the bladder, and diminish the irritable condition of that organ in chronic inflammation; it is frequently combined with anodynes, as hyoscyamus or opium, and with either dilute mineral acids or alkalies, according to the indications of the case; if taken in large quantity, it may produce purging; its alleged property of dissolving calculi has not been confirmed.

DECOCTUM PAREIRÆ.—Decoction of Pareira.—When strained, this preparation is often turbid, depositing insoluble matter after a time, if allowed to stand.

Dose.—From f℥j. to f℥ij., taken three or four times in the day.

Preparation—Pareira, sliced, ℥jss.; distilled water, Ojss.; boil for fifteen minutes, and strain. The produce should measure Oj.

EXTRACTUM PAREIRÆ LIQUIDUM.—**Liquid Extract of Pareira.**—May be given with the decoction, or other diuretics. All the preparations of pareira require to be persevered in for a considerable time to produce their full effects.

Dose.—From fʒss. to fʒj.

Preparation—Pareira, in coarse powder, lb. j.; boiling distilled water, Oj.; macerate for twenty-four hours, pack in a percolator, and add more water, until the root is exhausted; evaporate the liquid by a water bath to f℥xiij., and when cold add rectified spirit, f℥iij., and filter through paper.

Papaveraceæ.—Herbs, abounding in milky juice; leaves alternate, usually divided, exstipulate; sepals two, caducous; petals three or four, crumpled in æstivation; stamens numerous, with adnate anthers; ovary with parietal placentation; fruit capsular; seeds with oily albumen.

RHŒAS—**The Field Poppy (Papaver Rhœas).**—Is a well-known corn-field weed; its petals are used to impart a scarlet colour to acid mixtures; they should be dried quickly after gathering; whilst recent they have a slight opiate odour, and become odourless and violet-coloured by drying; they do not appear to have any appreciable medical property.

Botany.—Annual; stem branched, with stiff hairs; leaves pinnatifid; flowers bright scarlet; capsule smooth, nearly globose, with ten or more stigmatic rays.

SYRUPUS RHÆADOS.—**Syrup of Red Poppy.**—Added to mixtures for a colouring agent.

Dose.—fʒj. to fʒij.

Preparation.—The dried petals, ℥xiij.; add gradually to distilled water, Oj., heated in a water bath, frequently stirring, and afterwards, when the vessel is removed, macerate for twelve hours; express the liquid, strain, and dissolve in it refined sugar, two and a quarter pounds, by means of heat; when nearly cold, add rectified spirit, f℥ijss., and distilled water, so that the product shall weigh lb. iij. ℥x., and have sp. gr. 1·330. (By measure Oij., f℥xiijss.).

PAPAVER SOMNIFERUM.—**The Medical Poppy.**—Is extensively cultivated in the East for preparing opium; in England it is grown chiefly for its capsules, which are gathered when nearly ripe; they are spheroidal, two or three inches in diameter, containing numerous small seeds, which abound in oil, but have no narcotic effects, and are not used in medicine; dried poppy heads are considered anodyne; their remedial properties are trifling.

Botany.—An annual herb; stem smooth, two to six feet high; leaves alternate, sessile, glaucous, with wavy-toothed margin; flowers large, terminal, drooping before flowering; capsule globose, with sessile stellate stigma.

DECOCTUM PAPAVERIS.—Decoction of Poppy.—Used for fomenting inflamed and painful parts, tumors, or superficial excoriations; sometimes injected in uterine and vaginal diseases.

Preparation.—The capsules, bruised and freed from seeds, ℥iv.; distilled water, Oiij.; boil for ten minutes, and strain; the product should measure f℥xxxij.

SYRUPUS PAPAVERIS.—Syrup of Poppy.—Prescribed in infantile diseases, as a narcotic and anodyne; its use is not free from danger with young infants, for cases are reported in which a teaspoonful proved fatal—possibly an adulterated syrup containing laudanum may have been given, which is said to be an occasional, but most dangerous substitution; for adults it is added to pectoral or astringent mixtures.

Dose.—For children, fʒss. to fʒj.; for adults, fʒij. to f℥ss.

Preparation.—Macerate poppy capsules, bruised and freed from seeds, ℥xxxvj., in boiling distilled water, Oxx., in a water bath, kept hot for twelve hours; then evaporate all the water, except that absorbed by the capsules; press strongly, and strain; reduce the liquid to Oiij., and when cold, add rectified spirit, f℥xvi.; mix, and filter; distil off the spirit; evaporate the remaining liquor to Oij.; add refined sugar, lb. iv. The product should weigh lb. vjss., and have sp. gr. 1·320.

The spirit is used to precipitate albuminous matter, which promotes fermentation if allowed to remain in the syrup. The resulting product measures nearly Oiij., f℥xix.

OPIUM.—Is obtained by incising the unripe capsules of the poppy after the petals have fallen, taking care that the incision does not penetrate the inside of the capsule; a milky juice exudes, concreting into a viscid mass, or small tears, which is collected next morning by scraping it off with blunt knives; in India the process is repeated so long as the poppy yields any juice; the amount procured and its value are greatly influenced by the state of the weather, the degree of dryness or moisture in the air, and the presence or absence of dew.

Smyrna or Turkey Opium—Is the only variety which is officinal; it is imported in irregular-shaped lumps, weighing from four ounces to two pounds each, enveloped in poppy leaf, and packed with rumex capsules; if fresh, it is soft, and slightly moist; composed of reddish-brown agglutinated tears, having a shining surface when rubbed smooth with the finger, and giving off a strong opiate odour.

This opium, when of good quality, affords from eight to ten per cent. of morphia, and three or four of narcotine.

Egyptian Opium—Is seldom met in commerce; it is described as occurring in flat rounded cakes, three inches in diameter, each covered by some leaf; it has a reddish colour, uniform composition, and feeble musty odour, and should yield from six to eight per cent. of morphia.

Indian Opium.—The poppy is largely cultivated in the districts of Benares and Behar, where it is grown in the cold season; about February, when in full flower, the petals are gathered, and dried into thin circular cakes by heating them over a slow fire in earthen vessels; these cakes are used to form the outer covering of the opium balls. The opium itself, when recently gathered, is a wet granular mass of pinkish hue; the liquid that drains from it, mixed with some opium, serves as a paste for binding the petals together. The crude opium is reduced to a uniform strength by trampling it in vats, and mixing different specimens until it reaches a standard quality, which will leave on evaporation seventy per cent. of solid residue. It is then weighed out in portions; each of these is placed on a cake of prepared poppy leaves, laid inside a brass cup; and by rapidly folding leaf over leaf, and pasting them with poppy juice, a round ball is obtained, which when perfectly dried is fit for exportation. Almost the entire of the opium thus made is exported to China, where it is employed for smoking; the balls will each weigh about lb. iijss., the enclosing capsule of leaves being ℥xiv. Indian opium when fresh is a soft extract of blackish colour; it yields from two to three per cent. of morphia, and a considerable proportion of narcotine.

Several other varieties of opium are described, none of which are met in English commerce.

Composition.—Its analysis is complicated; in addition to gum, resinous matters, and essential oil, in minute quantity, it contains four to five per cent. of caoutchouc, and the following substances:—

$C_{14}HO_{11}, 3HO$, .	Meconic acid, .	Six to eight per cent.
$C_{34}H_{19}NO_6$, . . .	Morphia, . . .	Three to twelve per cent.
$C_{36}H_{21}NO_6$, . . .	Codeia, ...	Of each less than one per cent.
$C_{38}H_{21}NO_6$, . . .	Thebaine, . .	
$C_{40}H_{21}NO_8$, . . .	Papaverine, .	
$C_{46}H_{29}NO_{14}$, . .	Narcotine, . .	Six to eight per cent.
$C_{46}H_{29}NO_{18}$, . .	Narceine.	

Meconic Acid, when pure, forms pearly scales, soluble in four parts of boiling water, decomposed by ebullition into comenic and carbonic acids. It is obtained by precipitating with acetate of lead, and removing the lead afterwards with sulphuretted hydrogen. It produces a blood-red colour with perchloride of iron, which is distinguished from that caused by sulphocyanides with iron persalts, by the latter being destroyed with nascent hydrogen. Meconic acid appears to be inert.

Codeia is powerfully alkaline, crystallizing in octohedra. It is separated from morphia, which it resembles in medical properties, by being more soluble in water and ether, insoluble in the fixed alkalies, and not reddened with nitric acid, or made blue by perchloride of iron.

Thebaine forms square silvery plates, tasting acrid. Magendie considers its effects similar to strychnia.

Papaverine strikes a deep blue with strong sulphuric acid. Its properties are said to be unimportant.

Narcotine exists in at least four homologous forms,—that got in Egyptian opium yielding ammonia when treated with potash, whilst the other varieties afford methylamin, ethylamin, and propylamin. It is extracted by ether, is almost insoluble in water, and becomes blood-red with a mixture of concentrated sulphuric and nitric acids. Its salts, which are bitter, have been employed instead of quinine. Narcotine can be separated from morphia by dissolving out the morphia in weak acetic acid (Pelletier), or in solution of potash of 20° Baumè (Liebig).

Narceine is regarded as a neutral principle. It seems to be inert. With dilute mineral acids it forms blue solutions, becoming colourless if diluted.

Adulterations.—Different opiums will vary considerably in strength; besides this, sand, dirt, flour, and gummy matters, are intentionally added; hence, a process is advised to determine the amount of morphia it contains, which should reach at least six to eight per cent.

Test.—Take opium, 100 grains; break it down, and steep in distilled water, f℥j., for twenty-four hours, stirring frequently; place in a displacement apparatus, and pour on distilled water, f℥iij., in successive portions, so as to exhaust the opium; place the infusion in a flask; add slaked lime, 100 grains; boil for ten minutes; place the undissolved part on a filter, and wash with boiling water, f℥j. Acidulate the filtered fluid slightly with dilute hydrochloric acid; evaporate to f℥ss., and cool; neutralize cautiously with solution of ammonia, avoiding excess; filter off the brown matter which separates; wash with hot water, f℥j.; mix the washings with the filtrate; concentrate all to f℥ss., and add slight excess of ammonia; after twenty-four hours, collect the precipitated morphia on a weighed filter; wash with cold water, and dry at 212°. It should weigh at least six to eight grains.

This is a modification of Mohr's process. Morphia dissolves in the solution of lime; by adding muriatic acid, and then neutralizing with ammonia, resinous and colouring matters are got rid of; an excess of ammonia, throwing down pure morphia.

Effects.—In doses of one-fourth to half a grain, opium may produce decided stimulant effects; it increases the force of the pulse, induces a pleasing state of exhilaration, and rapid succession of fleeting thoughts, and invigorates the muscular powers. This is the condition desired by the opium-eater, which appears to require increasing doses for its production; it is followed by sleep, nausea, lassitude, and diminished nervous energy, demanding relief from fresh opiates; when full medical doses are employed, the stage of excitement is transitory or absent; the pulse becomes slower; pain, if present, is less distressing; a dreamy, inactive condition succeeds;

external impressions are indistinctly felt; and within half an hour slumber commences, lasting six to twelve hours, at times disturbed by dreams, and liable to be followed by nausea, distressing headach, and constipation. When poisonous doses are taken, giddiness and stupor soon result; the patient can be roused by shaking him, or loud speaking, but rapidly sinks into an insensible condition, with stertorous breathing; the surface of the body, at first warm and sweating, becomes clammy and cold; the pupils are usually extremely contracted, the pulse imperceptible; the face acquires a ghastly expression; and death ensues within twelve to twenty-four hours. Some exceptional cases are recorded where several hours elapsed before the effects of the drug were observed to become developed; those have usually been cases where an excessive quantity was taken, and in the end are rapidly fatal.

Opium is a favourite stimulant and intoxicating substance; the Chinese employ it by smoking an extract; other Eastern nations prefer to eat the solid drug, and individuals who take it in these lands in general make use of the tincture. This habit is considered to be highly disastrous, inducing premature decay of the bodily and mental powers, and reducing its votaries to the lowest stage of degradation ; there is ample evidence that it is capable of producing the worst results when indulged in without restraint; but I believe that, like any other stimulant or intoxicating agent, opium may be persevered in for a long time, and to some excess, without appreciably affecting the health or strength; the habit of using it, however, creeps on so rapidly, and obtains such influence, that, few as there are who can relinquish alcoholic stimuli when once habituated to them, still fewer appear capable of resisting the craving for opiates. There are two distinct classes by whom it is employed—the healthy, who have recourse to it secretly, instead of dram-drinking, and for this reason seldom voluntarily disclose the fact—I do not believe they are numerous in Ireland; the others seek its solace when suffering from some painful or exhausting disease, as chronic diarrhœa, neuralgia, or cancer, and take it in rapidly increasing doses; as they fall more often under our observation, we are prone to form our ideas from its obvious effects upon their health.

One of its principal medical uses is to relieve pain; thus it is given in severe colic, during the passage of renal or hepatic calculi, for dysmenorrhœa, and in gouty and rheumatic attacks; for acute febrile rheumatism Dr. Corrigan strongly advises it in gradually increasing doses, until decided relief is obtained; and I have seen several cases most successfully treated after this plan; for cancer it often forms the last and only solace of the sufferer, particularly when attacking the rectum or uterus; in neuralgia it may assuage the agony for a time, but seldom cures, and cannot be considered a beneficial remedy, too often leading those who indulge in it to confirmed habits of opium-eating.

To induce sleep after painful operations, superficial burns, and for irritable states of the nervous system, opium is an invaluable agent; in delirium tremens it is preferably given in solution, combined with stimulants in asthenic cases, and in some instances answers still better if prescribed with full doses of chloroform; during severe tetanus there is a remarkable tolerance of the effects of this drug, so that excessive doses can be administered without causing proportional symptoms; but as chronic cases of tetanus appear to recover under the most opposite modes of treatment, it is almost impossible to ascribe decided value to those numerous remedial agents that have been recommended for it. In insanity, anodynes are indicated when prolonged want of sleep continues, after employing full evacuations; in such cases, when opium could not be readily given by the mouth, it has been exhibited in enema, or applied over blistered surfaces; for these cases also the hypodermic use of morphia is of service.

Simple and bilious forms of diarrhœa are generally treated with opiates, which can be combined with aromatics and astringents; in the colliquative diarrhœa of phthisis, after other means fail us, the opiate injection will at least afford temporary relief. In recent attacks of dysentery, a full opiate sometimes arrests the disease; and when more severe, small doses are exhibited with mercurials, or it is employed per anum to check the distressing tenesmus; for chronic dysentery it is prescribed with tonics—as calumba, or different vegetable and mineral astringents—and in irritable states of the stomach, is given in effervescing draughts; a similar treatment often proves successful in arresting the vomiting and purging of autumnal diarrhœa, or English cholera.

In inflammatory affections of the abdominal viscera, opium is of essential service; when obstinate constipation and vomiting result from ileus, after a fair trial of purgatives, they should be discontinued, and opiates substituted, with or without mercurials—employing repeated small leechings or blisterings at the same time over the seat of the obstruction. In peritonitis—particularly in low forms of the disease, attended with little febrile disturbance; in puerperal attacks; and when there is much pain or tenderness, as in those distressing cases resulting from perforation of the hollow viscera, the stomach, intestines, bladder, or pregnant uterus, the liberal administration of opium in repeated doses, keeping the patient well under its influence, holds out the best prospect of recovery, and at least alleviates suffering: in those affections there is unusual tolerance of its narcotic effects, so that large doses can be safely borne.

For bronchitic attacks, with severe paroxysmal cough and scanty secretion, in the irritable cough of incipient phthisis, some forms of spasmodic asthma, and during the latter stages of hooping cough, opiates combined with expectorants are useful; they are injurious, and should not be given, in the early stage of acute catarrh, as they arrest the natural termination of the disease by free mucous discharge; and also when the bronchial tubes are filled with fluid, from diminishing the sensibility of the lungs, and permitting the accumulated mucus to exclude the air. In continued fever, the instances for which opium should be employed are few; cases do occur where watchfulness, delirium, and restlessness are observed, resembling the symptoms of delirium tremens, and requiring opiates or chloroform to induce sleep; similar nervous attacks are liable to originate during the progress of the acute eruptive fevers. In small pox, when the rash is extensive, and confluent, as the pustules fill about the eighth or tenth day, and whilst subsequently drying up, the widespread cutaneous irritation and loss of rest may cause so much excitement, that opiates become indispensable to prevent acute maniacal symptoms, or even a fatal result.

In attacks of hæmoptysis depending on the presence of tubercle, opium is prescribed with acetate of lead; and laudanum is given in doses of thirty to forty drops, to relieve the nervous condition of the system, throbbing of the head, and rapid jerking pulse, which attend copious uterine hæmorrhage after delivery.

The painful gangrene resulting from acute arteritis, and some severe sloughing syphilitic sores, are benefited by being treated with opiates; in senile gangrene this practice, introduced by Pott, is still followed; from two to four grains being given in divided doses, during the twenty-four hours, increasing the quantity in proportion as the patient becomes accustomed to its use.

In vesical and urinary diseases, the pain and irritable condition of the bladder are relieved by this remedy; it also allays the nervous exhaustion which invariably attends continued phosphatic deposits, or disease of the prostate. Some recommend it for diabetes, to diminish the thirst, and the excessive quantity of urine; I have not found it of the slightest advantage in either respects.

Applied externally, laudanum is added to collyria, and eye-drops of wine of opium are used for chronic and subacute ophthalmia, to relieve scalding pain and lacrymation, and restore the conjunctiva to a healthy state. Stupes containing opiates are employed in the same manner as decoction of poppy; they require care if used over extensive denuded parts, as burns, from the danger of absorption of the drug; this is most to be dreaded with infants, who are peculiarly susceptible of its narcotic action in every form; in embrocations it is applied for chronic rheumatism, and other painful affections, and for old sprains. Enemas and suppositories containing opium are used to check diarrhœa and tenesmus, and for diseases of the prostate or rectum; similar applications may be used in uterine maladies, if necessary, being introduced within the vagina; cacao butter is a good vehicle for preparing such suppositories.

Antidotes.—None; in poisoning by opium the stomach pump should be promptly used, or stimulant emetics, as mustard or sulphate of zinc, given to induce rapid vomiting; and every means employed to ward off the lethargy by exercise, tickling the feet, or electro-magnetic shocks; strong coffee is recommended. In advanced stages of opium poisoning it is dangerous to attempt to walk the patient about, which may cause fatal syncope; artificial respiration has succeeded in some apparently desperate instances, and should be persevered in for hours if required.

Dose.—One grain is the average quantity; full doses of two to four grains are employed to relieve severe pain, for delirium tremens, and tetanus; they are best given in solution. When opium is persevered in for some time, its dose must be augmented; this tolerance is well seen in the enormous amounts consumed by habitual opium-eaters, or patients suffering from advanced cancer. Small doses of one-eighth to one-fourth of a grain are prescribed for diarrhœa and catarrhs, and to guard mercurials from affecting the bowels.

The minimum fatal dose of opium for the adult is about four grains; of laudanum, f℥ij.: these must be considered exceptional.

EXTRACTUM OPII.—Extract of Opium.—Good opium affords about sixty to seventy per cent. of aqueous extract, which should be proportionally more active than the crude drug, if not injured during the process; it is blackish, with slight odour, and bitter taste; some consider that its effects are less stimulating; its only advantage appears to be its solubility in water.

Dose.—Gr. j., similar to opium.

Preparation.—Opium, in thin slices, lb. j.; distilled water, Oij.; macerate for twenty-four hours, and express the liquor; reduce the opium to a pulp, macerate again in distilled water, Oij., for twenty-four hours, and express; repeat the operation a third time; mix the liquors; strain through flannel, and evaporate to a proper consistence.

EXTRACTUM OPII LIQUIDUM.—Liquid Extract of Opium.—Appears to be intended as a substitute for Battley's anodyne; assuming the strength of the extract to be one-third more than crude opium, it may be given in the same doses as laudanum.

Dose.—Ten to forty drops.

Preparation.—Extract of opium, ℥j.; distilled water, f℥xvij.; digest for an hour, stirring frequently; filter; add rectified spirit, f℥iij.; the produce should measure Oj.

PILULA OPII.—Opium Pill.—May be used either as a pill mass or as a suppository; every gr. v. are equivalent to gr. j. of opium.

Dose.—Five grains.

Preparation—Hard soap, ℥ij.; reduce to fine powder; add opium, in fine powder, ℥ss.; distilled water, a sufficiency. Mix.

TROCHISCI OPII.—**Opium Lozenges.**—Each lozenge contains one-tenth of a grain of extract of opium; they are prescribed to relieve irritating cough or slight diarrhœa.

Dose.—One or two lozenges, thrice daily.

Preparation.—Extract of opium, gr. lxxij., softened with a little water; tincture of tolu, f℥ss.; add these to extract of liquorice, ℥vj., heated in a water bath; when reduced to proper consistence, remove it to a slab; add refined sugar, ℥xvj.; gum arabic, ℥ij., previously powdered and mixed together, and mix all thoroughly; divide the mass into 720 lozenges, and dry them in a hot air chamber with moderate heat.

TINCTURA OPII. — **Tincture of Opium.** — In preparing laudanum, about two-thirds of the opium dissolve; the residue consists of comparatively inert matter; if freshly made, it is light brownish-red, deepening on exposure to light; allowing for trifling loss, each fʒj. is equivalent to gr. iv. of crude opium.

Dose.—Fifteen to thirty drops for a full anodyne; in delirium tremens, forty drops to fʒj. may be given; if prescribed for infants under a year old, it must be administered with caution, as a single drop has caused dangerous results.

Preparation.—Opium, in coarse powder, ℥jss.; proof spirit, Oj.; macerate for seven days; strain, express, and filter, adding sufficient proof spirit to make Oj.

VINUM OPII.—**Wine of Opium.**—Is given internally, in the same manner as laudanum; it is also added to eye lotions, or used for dropping into the eye, in chronic conjunctivitis, when there is much scalding pain, lacrymation, and intolerance of light; it excites sharp pain which soon subsides and is followed by rapid improvement in the symptoms.

Dose.—Similar to the tincture.

Preparation.—Opium, in powder, ℥jss.; sherry, Oj.; macerate for seven days; strain, press, and filter, adding sherry to make up Oj.

LINIMENTUM OPII.—**Opiate Liniment.**—Anodyne liniment is applied to sprains and rheumatic affections as an embrocation; when opiates are rubbed to the unbroken skin, their effects are trivial.

Preparation.—Tincture of opium, liniment of soap, of each, f℥ij. Mix.

ENEMA OPII.—**Enema of Opium.**—Is used in diarrhœa, tenesmus, disease of the bladder, uterus, or rectum, and as an anodyne when opium is not tolerated by the stomach; injections like this, designed to be retained, should always be of small bulk, and are best administered with an elastic bottle; this enema is intended for the adult.

Preparation.—Tincture of opium, fʒss.; mucilage of starch, f℥ij. Mix.

EMPLASTRUM OPII.—Plaster of Opium.—Applied to rheumatic and neuralgic affections, and over painful tumors; its efficacy is slight.

Preparation.—Resin plaster, ℥ix.; melt in a steam or water bath; add gradually opium, in fine powder, ℥j. Mix.

MORPHIÆ HYDROCHLORAS.—Hydrochlorate of Morphia ($C_{34}H_{19}NO_6$, $HCl + 6\,HO$).—Crystallizes in white, silky, flexible acicular prisms; very bitter; unchanged by exposure to air, and soluble in water or spirit; the salt is known to be a muriate by giving a curdy white precipitate with nitrate of silver, soluble in ammonia; its morphia strikes a red colour with nitric acid, and becomes greenish-blue with solution of perchloride of iron. Morphia exists in opium, combined with meconic and sulphuric acid; when pure, it crystallizes in small rectangular prisms, $+ 2HO$; it dissolves freely in boiling alcohol; is insoluble in ether, and melts in the fixed alkalies without change, depositing from them again as they absorb carbonic acid.

Preparation.—Opium, sliced, lb. j.; distilled water, Oij.; macerate for twenty-four hours, and decant; macerate the residue for twelve hours in Oij. more of water; decant, and repeat the process a third time, subjecting the insoluble residue to strong pressure; unite the liquors; evaporate on a water bath to Oj., and strain through calico; pour in chloride of calcium, three-quarters of an ounce, dissolved in distilled water, f℥iv., and evaporate the solution until it becomes solid on cooling; envelope the mass in strong calico, double folded, and subject it to powerful pressure, preserving the dark fluid which exudes; triturate the squeezed cake with about Oss. of boiling distilled water, and the whole being thrown on a paper filter, wash the residue with boiling distilled water. The filtered fluids having been evaporated as before, cooled and solidified, again subject the mass to pressure; and, if still much coloured, repeat this process a third time, the expressed liquids being always preserved.

Dissolve the pressed cake in boiling distilled water, f℥vj.; add purified animal charcoal, one-quarter of an ounce; digest for twenty minutes; filter; wash the filter and charcoal with boiling distilled water, and to the solutions thus obtained add solution of ammonia in slight excess; let the pure crystalline morphia which separates as the liquid cools be collected on a paper filter, and washed with cold distilled water until the washings cease to precipitate with solution of nitrate of silver acidulated by nitric acid.

From the dark liquids expressed in the above process an additional product may be got by diluting with distilled water, precipitating with considerable excess of solution of potash, filtering, and supersaturating the filtrate with hydrochloric acid. This acid liquid, digested with a little animal charcoal, and again filtered, gives, on the addition of ammonia, a small quantity of pure morphia.

Diffuse the pure morphia obtained above in boiling distilled water, f℥ij., placed in a porcelain capsule kept hot; add, constantly stirring, dilute hydrochloric acid, f℥ij., or sufficient, proceeding with caution, so that the morphia may be entirely dissolved, and a neutral solution obtained; set it aside to cool and crystallize; drain the crystals, and dry them on filtering paper. By further evaporating the mother liquor, and again cooling, additional crystals are obtained.

When opium is dissolved in water, the extractive matter and much of the narcotine remain insoluble. The addition of chloride of calcium converts the morphia and codeia into muriates, the lime uniting with meconic acid; and, when evaporated, these substances form the cake. The dark expressed liquid obtained from this consists of extractive matter, some colouring, narcotine, and a little morphia. When redissolved in boiling water, the lime salts are got rid of, being insoluble, the solution consisting of muriate of morphia and codeia. This is decolorized by the animal charcoal, and ammonia afterwards added in slight excess; muriate of ammonia is thus formed, in which codeia is soluble, and pure morphia will be thrown down. The morphia is subsequently converted into a muriate, and crystallized.

PURITY.—Fixed adulterations are detected by heating the pure salt, which is completely destroyed, leaving no residue. Twenty grains, dissolved in warm water, f℥ss., with ammonia, added in the slightest possible excess, give on cooling a crystalline precipitate, which, washed with a little cold water, and dried by exposure to air, weighs 15·18 grains.

EFFECTS.—Muriate of morphia is the salt now preferred for medical purposes, being of definite strength, and unchanged by keeping, whilst the acetate by exposure to air parts with some of its acid, becoming partially insoluble; it is assumed in officinal preparations to be eight times stronger than opium—a calculation hardly borne out by its therapeutic effects, which would lead us to value it at about four times the strength of good opium. In large doses it produces all the symptoms which result from an over-dose of opium—drowsiness, rapidly passing into deep coma, with stertor, and contracted pupil, and convulsions, have been frequently noticed. Professor Taylor regards two grains as sufficient to cause a fatal result—far less would kill a child; and half a grain is alleged to have induced dangerous symptoms in an adult, but this must be considered exceptional.

Administered in ordinary medical doses, it is employed in the same manner as crude opium; the sensations of itching over the body, subsequent nausea, and inability to discharge the bladder which are described as peculiar to morphia, will all follow a full opiate; and they are both equally liable to cause headach and constipation; its advantages are its definite composition and portability, the ease with which it can be applied endermically to blistered surfaces, and also used hypodermically injected into the cellular tissue in solution with a fine trocar and syringe—a plan of medication with energetic substances, introduced some years since; if employed in this manner, the dose need not exceed one-half of that given by the mouth. The operation is recommended for neuralgic attacks, in gastrodynia, and obstinate vomiting; and Dr. Rynd used it in a concentrated solution in creasote, to relieve sciatica and tic doloroux.

Antidotes.—Similar to opium.

Dose.—One-eighth to one-fourth of a grain, given in pill or solution; like opium, its effects diminish by continued use. Applied to blistered surfaces after removing the cuticle, the usual dose will be gr. j. to gr. ij., mixed with a little starch.

LIQUOR MORPHIÆ HYDROCHLORATIS.—Solution of Hydrochlorate of Morphia.—Is assumed to be equivalent to laudanum, taking the salt as eight times the strength of opium; in practice the dose will be found rather greater—twenty to forty drops acting as an anodyne.

Preparation.—Dilute hydrochloric acid, eight minims; rectified spirit, fʒij.; distilled water, fʒvj. Mix, and dissolve hydrochlorate of morphia gr. iv.

SUPPOSITORIA MORPHIÆ.—Morphia Suppositories.—These contain one-fourth grain of morphia in each; they are used in the tenesmus of dysentery, painful affections of the bladder and uterus, and for the purging of phthisis. All suppositories require to be introduced above the internal sphincter, to be retained; cacao butter is much used for making them in practice.

Preparation.—Lard and white wax, of each, gr. xxx., are melted in a water bath, mixed with hydrochlorate of morphia, gr. iij., refined sugar, gr. xxx., previously rubbed together, and the mass, when solid, divided into twelve parts, and formed into cones; when sufficiently firm, these are dipped in a mixture of wax, three parts, lard, eight parts, melted together, and set aside in a cool place until the coating hardens.

TROCHISCI MORPHIÆ.—Morphia Lozenges.—Are intended to relieve irritating cough; they contain $\frac{1}{36}$th of a grain of hydrochlorate of morphia in each lozenge.

Dose.—One or two, taken every second or third hour.

Preparation.—Dissolve hydrochlorate of morphia, gr. xx., in boiling distilled water, f℥ss.; add this to tincture of tolu, f℥ss., mixed with mucilage of gum arabic, f℥ij., and mix all with refined sugar in powder, ℥xxiv.; gum arabic, in powder, ℥j., into a proper mass; divide into 720 lozenges; dry them in a hot air chamber with moderate heat.

TROCHISCI MORPHIÆ ET IPECACUANHÆ. — Lozenges of Morphia and Ipecacuanha.—Are similar to the last, containing in addition one-twelfth of a grain of ipecacuanha in each.

Preparation.—Dissolve hydrochlorate of morphia, gr. xx., in boiling distilled water, f℥ss.; add tincture of tolu, f℥ss., mixed with mucilage of gum arabic, f℥ij., and beat into a mass with ipecacuanha, gr. lx.; gum arabic, ℥j.; refined sugar, ℥xxiv., all in powder, and divide into 720 lozenges; dry them in a hot air chamber with moderate heat.

Cruciferæ.—Herbs, with juice affording sulphur; leaves alternate; bracts, none; flowers in corymbose racemes; sepals four; petals cruciate; stamens tetradynamous; ovary superior; fruit a silique or silicule; seeds attached to the replum, exalbuminous, with the radicle folded on the cotyledons.

SINAPIS.—Mustard.—Table mustard is prepared by pulverizing the seeds of the black and white varieties of the plant, usually adding flour, turmeric, and red pepper; when pure it is a brown oily powder, unlike the commercial article; black mustard seed, by expression, yields about twenty-eight per cent. of a mild fixed oil; myrosine, a form of vegetable albumen; and myronic acid, a bitter, odourless, non-crystalline acid, containing sulphur, which is decomposed by myrosine, in the presence of water (similar to the reaction of bitter almond oil) producing volatile oil of mustard, $C_8H_5NS_2$; this oil is painfully pungent, and blisters the skin; it is considered a sulphocyanide of allyl, written CyS_2Ayl; whilst the oil of garlic is a sulphuret of the same base; it boils at 290°.

White mustard neither contains nor yields volatile oil; its acridity is caused by a fixed principle, which decomposes with water, the hydro-sulphocyanate of sinapine.

Botany.—S: nigra.—An annual; stem two to four feet high; leaves large, rough, lyrate, the upper ones lanceolate; flowers yellow; silique small, quadrangular, with a short style; seeds dark brown, and beautifully veined externally.

S: alba.—Stem one or two feet high; flowers large; silique hispid, with a long beak, seeds few and yellow.

Purity.—Particles of red pepper are recognised by using a lens; a cooled decoction should not become blue with iodine, showing the absence of starch.

Effects.—Mustard, in ℥ss. doses, is a stimulating emetic, useful in poisoning by opium and other narcotics, intoxication with threatened apoplexy, suffocative catarrh, and the early stages of cholera; it should be mixed with tepid water, and taken immediately, as its acridity becomes developed when it is mixed for some time.

CATAPLASMA SINAPIS.—Mustard Poultice.—The local effects of sinapisms vary considerably: some complain of severe pain, others bear them until vesication ensues; this depends on different degrees of cutaneous sensibility, and is not a safe guide in practice; for when sensation is impaired in paralysis, destructive sloughing might result from the protracted use of mustard; it is therefore better to remove sinapisms when the surface become well reddened, and for children or persons with tender skin to dilute the poultice with three or four parts of linseed meal; it should be spread on linen or thick paper, and is often covered with muslin, to prevent its adhering to the skin. Sinapisms are used in the stupor and delirium of low fever, apoplexy, and narcotic poisoning; to relieve rheumatic, pleuritic, and other acute pains; as a counter-irritant in bronchitic attacks, and in all cases where it is desirable to produce a speedy and powerful rubefacient action.

Preparation.—Linseed meal, ℥ijss.; boiling water, f℥x. Mix gradually, and add mustard, ʒijss.

COCHLEARIA ARMORACIA.—Horse Radish.—The pungent acrid root yields an oil resembling mustard; it is most energetic in spring and autumn, losing its properties by drying; the scraped root is added to foot baths, to render them more stimulating, and is diuretic; like all the cruciferæ, the plant also possesses antiscorbutic powers.

Botany.—Root perennial, long and white; leaves stalked, large, smooth, deep green, much veined, resembling water dock; flower stem erect, two to three feet high; inflorescence a raceme; silicules globose, without a dorsal nerve.

SPIRITUS ARMORACIÆ COMPOSITUS.—Compound Spirit of Horse Radish.—Added to diuretic mixtures for treating dropsies, particularly in debilitated states of the system.

Dose.—fʒj. to fʒiv.

Preparation.—Horse radish, sliced, ʒxx.; bitter orange peel, ʒxx.; nutmeg, bruised, ʒss.; proof spirit, one gallon; water, Oij. Mix, and distil one gallon, with moderate heat.

Polygaleæ.—Herbs or shrubs; leaves simple, exstipulate; bracts three; flowers falsely papilionaceous; sepals five, irregular, the two inner ones usually petaloid; petals united, usually three, the anterior keel larger, and sometimes crested; stamens, six to eight, monadelphous; anthers one-celled; ovary two-celled, each with a single pendulous ovule; seeds albuminous, with a straight embryo.

POLYGALA SENEGA.—**Senega.**—This root is imported in bales from the southern and western States of America; it varies in thickness, from that of a quill to the little finger; is contorted and corrugated, with a keel-like line extending along its whole length; the cortical part is transversely cracked, yellowish when young, brownish-grey if old; it has a faint odour; tastes mucilaginous, and afterwards acrid, causing an unpleasant sensation in the throat, the woody part inside being inert; it yields with other vegetable matters polygalic acid—a white inodorous powder, tasting strongly of senega, and virgineic acid—a volatile reddish oil, of disagreeable smell.

Botany.—Root perennial, branched, with many erect annual stems, nine to twelve inches high, tinged with red inferiorly; leaves sessile, and alternate; flowers small, white, in terminal racemes; capsule small, with two black seeds.

Effects.—Senega is a stimulating expectorant, diuretic and diaphoretic; in full doses causing purging and vomiting; it is chiefly prescribed in bronchitic attacks with excessive expectoration, chronic catarrh, and peripneumonia notha, combined with preparations of squill, spirit of nitre, and ammonia, and appears to exert a special tonic influence over the bronchial mucous membrane. Dr. Wood, of Philadelphia, speaks in high terms of its efficacy in the advanced stage of acute bronchitis, when given with small doses of tartarized antimony; and I have found it most useful for treating the intercurrent pulmonary complications of hooping cough; it has occasionally been used as a diuretic in dropsies, and for amenorrhœa, but with less decided results.

INFUSUM SENEGÆ.—**Infusion of Senega.**—Prolonged boiling is considered to render a portion of the active principle inert, by precipitating it with albumen and colouring matter; according to Quevenne, its best solvent is water at 104°.

Dose.—f℥ss. to f℥j., repeated every two to four hours.

Preparation.—Senega, bruised, ℥ss.; boiling distilled water, f℥x. Infuse in a covered vessel for one hour, and strain.

TINCTURA SENEGÆ.—**Tincture of Senega.**—Dilute alcohol is an excellent solvent of the active portion of senega.

Dose.—fʒj. to fʒij., added to the infusion, or to other expectorants.

Preparation.—Senega, bruised, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, like tincture of aconite; to yield Oj.

Krameriaceæ.—Distinguished from Polygaleæ by wanting the falsely papilionaceous flowers, having a simple one-celled ovary; seeds without albumen.

KRAMERIA TRIANDRIA.—Rhatany.—Is a shrub growing in the mountains of Peru; its roots consist of long woody ramifications, often rising from a common root stock; they vary from the size of a quill to an inch in diameter; the bark is dark reddish-brown, easily separated, of strongly astringent taste, the hard woody centre being paler and less astringent. Rhatany root affords one-third its weight of substances soluble in water, consisting of tannic acid, 42·6; gallic acid, 0·3; gum, extractive, and colouring matter, 56·7; krameric acid, 0·4, in 100 parts; its medical properties are due to the tannin and krameric acid; both alcohol and water extract its active portion.

Botany.—A small shrub, much branched; roots long, creeping; stem procumbent; leaves oblong, sessile, and silky; flowers solitary, lake-coloured; calyx of four coloured sepals; petals five, irregular; stamens three; fruit, globular, indehiscent, covered with brown prickles.

Effects.—Tonic and astringent; used in the same diseases as kino, for chronic dysentery, diarrhœa, and passive uterine hæmorrhages; and constantly employed by dentists for tooth lotions.

INFUSUM KRAMERIÆ.—Infusion of Rhatany.—Prescribed in doses of f℥ss. to f℥j., for diarrhœa; in gargles, for relaxed sore throat; and as a vaginal injection in cases of leucorrhœa.

Preparation.—Rhatany, bruised, ℥ss.; boiling distilled water, f℥x. Infuse in a covered vessel for one hour, and strain.

TINCTURA KRAMERIÆ.—Tincture of Rhatany.—Added to astringent mixtures, and sometimes applied to heal fissures of the nipple.

Dose.—fℨj. to fℨij.

Preparation.—Rhatany, bruised, ℥ijss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

EXTRACTUM KRAMERIÆ.—Extract of Rhatany.—When of good quality, is shining reddish-brown, and highly astringent.

Dose.—Ten to twenty grains, in pills or solution.

Preparation.—Rhatany, in coarse powder, lb. i.; distilled water, Ojss.; macerate for twenty-four hours; pack in a percolator, and add more water until Oxij. are collected, or the rhatany is exhausted; evaporate this in a water bath to a proper consistence.

MALVACEÆ.—Herbs, or trees; leaves alternate, palmate, and stipulate; flowers axillary; calyx valvate; petals twisted; stamens monadelphous, with reniform anthers; ovary many-celled, or of many carpels, separable when ripe; seeds with little albumen; embryo curved, with twisted cotyledons.

GOSSYPIUM HERBACEUM.—COTTON.—Consists of hairs surrounding the seeds of several varieties of gossypium, carded for use; in chemical characters it resembles woody fibre; its filaments, under the microscope, appear like flattened ribbons, with transverse markings.

BOTANY.—A biennial or triennial plant; stems two to six feet high; leaves palmate and hoary; flowers yellow, purple at base of petals; capsule ovate, three to five celled, each with numerous seeds, imbedded in cotton down.

USES.—Cotton wadding forms a useful dressing for blisters when the cuticle is unbroken; it is also applied over recent burns and scalds; it allays pain, apparently by excluding the air, and should be disturbed as little as possible; for deep burns, some employ turpentine, mixed with resin cerate, under the cotton; but as the sloughs must become detached before granulating, poultices answer better.

PYROXYLIN $\left\{C_{36}\frac{H_{22}}{8\,NO_4}\right\}O_{30}$. GUN COTTON.—Is obtained by steeping cotton, or any form of cellulose, in a mixture of nitric and sulphuric acids; no change of form results; still, after a few minutes, when well washed, and dried at a temperature below 200°, it has acquired explosive properties, burning in the air more rapidly than gunpowder, and, if compressed, its effects are so violent and sudden, that it is not suited for a projectile agent. Mr. Hadow states that its composition varies according to the strength of the acid used in its preparation; part of the hydrogen of the cellulose, $C_{36}H_{30}O_{30}$, being replaced by six, seven, eight, or nine atoms of hyponitric acid, the last of the series got by using concentrated acids, NO_5, HO + 2 SO_3, HO, is highly explosive, and insoluble in a mixture of ether and alcohol; this will result from following the officinal formula; the pyroxylin, with 8 NO_4, requires a dilute acid, either adding half its volume of water to the nitric acid, or employing it of sp. gr. 1·420, which will afford the substance evidently intended to be made.

PREPARATION.—Sulphuric acid, nitric acid, of each, ℥v.; mix in a porcelain mortar; immerse cotton, ʒj., in it; stir for three minutes with a glass rod until it is thoroughly wetted by the acids; transfer the cotton to a vessel containing water; stir well with a glass rod; decant the liquid; pour more water on the mass; agitate again, and repeat the effusion, agitation, and decanting, until the washings cease to precipitate with chloride of barium; drain the product on filtering paper, and dry it in a vapour bath.

Purity.—It should readily dissolve in a mixture of ether and rectified spirit, and leaves no residue if exploded.

Used—To prepare collodion.

COLLODIUM.—Collodion (Pyroxylin dissolved in ether, mixed with one-third its volume of rectified spirit).—Is a transparent, colourless, syrupy liquid, which, if exposed to air, rapidly dries, leaving an adhesive membranous pellicle, insoluble in water or rectified spirit.

Preparation.—Ether, f℥xxxvj.; rectified spirit, f℥xij.; mix; add pyroxylin, ℥j.; set aside for a few days, and, should there be any sediment, decant the clear liquid; keep it in a stoppered bottle.

Effects.—It is employed to close recent wounds, by applying it with a hair pencil to the approximated edges; for fissured and excoriated nipples, and as a substitute for cuticle in recent burns; when drying, it contracts considerably, and if used over extensive surfaces may produce much pain; to counteract this inconvenience, an elastic collodion is made, by adding two parts of glycerine, or six of castor oil, as proposed by M. Guersant, to 100 parts of collodion.

Medicated collodions are obtained by mixing strong ethereal tinctures of cantharides, iodine, aconitine, or atropine, with ordinary collodion; they are used as substitutes for blisters, liniments, and other external applications, and have the advantages of cleanliness, and of being applied with ease over uneven surfaces.

When a simple adhesive material is required to exclude the air, and guard surfaces from friction, the following solution of gutta percha, often improperly termed collodion, which is officinal in the American Pharmacopœia, may be used; it is recommended for cutaneous eruptions, herpes, erysipelas, and small pox, and for threatened bed sores:—

SOLUTION OF GUTTA PERCHA (U: States, Ph).—Gutta percha, in thin slices, one and a half part; chloroform, twelve parts; shake till dissolved; add carbonate of lead, two parts, with chloroform, five parts, mix well, shaking frequently; after about ten days, when the insoluble and colouring matter subsides, pour off the clear solution for use.

Aurantiaceæ.—Trees or shrubs; leaves alternate, with oil glands, articulated to petiole; flowers fragrant; calyx short, bell-shaped; petals three to five, with the stamens inserted on a hypogynous disk; ovary free; fruit pulpy, many-celled; seeds exalbuminous.

CITRUS BIGARADIA.—The Bitter Orange.—By some considered only a variety of the sweet, is a native of India and China, now extensively cultivated in the south of Europe. Its flowers are distilled, to afford oil of neroli, much used in perfumery, and orange flower water, which is employed for making the syrup.

Orange flower water should be nearly colourless, of fragrant odour, giving, when free from metallic impurities, no precipitate with sulphuretted hydrogen. The dried unripe fruit, or orange berry, is dark brown, and solid, about the size of a cherry; when turned on a lathe they are sold for issue peas; they have no advantage over ordinary peas for this purpose. The rind of the bitter orange is aromatic and tonic, chiefly employed to communicate a pleasant flavour to other medicines, as bitter infusions and chalybeates.

Botany.—A tree, much branched, with smooth greenish bark; about fifteen feet high; evergreen, bearing flowers and fruit together; flowers large, white, and fragrant; fruit with convex oil cells, of deep orange colour; pulp and rind bitter.

SYRUPUS AURANTII FLORIS.—Syrup of Orange Flower.—Often termed syrup of capillaire. Used as a flavouring addition to draughts and expectorant mixtures.

Dose.—fʒj. or fʒij.

Preparation.—Refined sugar, lb. iij.; distilled water, f℥xvj.; dissolve with heat; strain, and, when nearly cold, add orange flower water, f℥viij., with enough distilled water to make the product lb. ivss. The specific gravity should be 1·330. (To measure Oij. f℥xiv.)

SYRUPUS AURANTII.—Syrup of Orange Peel.—Employed for its flavour.

Dose.—fʒj. or fʒij.

Preparation.—Tincture of orange peel, f℥i.; syrup, f℥vij. Mix.

TINCTURA AURANTII.—Tincture of Orange Peel.—Used as an agreeable addition to bitter mixtures.

Dose.—fʒss. to fʒj.

Preparation.—Bitter orange peel, cut small and bruised, ℥ij.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

INFUSUM AURANTII.—Infusion of Orange Peel.—A mild tonic; chiefly prescribed as a vehicle for salines, ammonia, or quinine.

Dose.—f℥j. to f℥ij.

Preparation.—Bitter orange peel, cut small, ℥ss.; boiling distilled water, f℥x. Infuse in a covered vessel for fifteen minutes, and strain.

CITRUS LIMONUM.—**The Lemon.**—A native of Asia, is cultivated in the Azores and Southern Europe, whence its fruits are imported; the fresh rind, unlike the orange, adheres closely to the pulp; it is used for its aroma, which is imparted to both boiling water and spirit.

Oil of lemon is best obtained by expression, its flavour becoming impaired by distillation; it consists essentially of a hydrocarbon, $C_{20}H_{16}$, isomeric with turpentine, and, like it, susceptible of various modifications; exposed to the air, it absorbs oxygen, and through age acquires a terebinthinate odour; when pure, it is colourless; sp. gr. 0·84; soluble in anhydrous alcohol; it is often adulterated with oil of turpentine,—a fraud difficult of detection, except by its evident characters.

Lemon juice is got from the pulp, by pressure, and after straining is fit for use; it contains about eighteen grains of citric acid in each half-ounce, with some saccharine matter and pectin; for the Navy it is prepared by adding one-tenth part of brandy, or concentrated by evaporation, or simply preserved in bottles, covered with a thin layer of olive oil. Lime juice, got from the *Citrus limetta* of the West Indies, is more acid, and preferred when it can possibly be obtained. From some recent analyses, Professor Galloway informed me, he had got ninety-one grains of anhydrous phosphoric acid, equivalent to 458 grains of phosphate of soda, from each gallon of lime juice as issued to the Navy. This cannot be an unimportant constituent in explaining its medical properties.

Botany.—A branched tree, ten to fifteen feet high, with stiff thorns; leaves oval or oblong; petiole with a narrow leafy border; flowers white, tinged with red.

Effects.—Lemon juice is invaluable, both for the prevention and cure of scurvy; the deprivation of a due supply of raw vegetable food would appear to be the source of this affection, and its restoration the best mode of treatment; for citric acid is greatly inferior to the expressed juice in medical properties; and fresh fruits of all kinds, and green vegetables, particularly cruciferous plants, are found successful in treating it.

As a preventive, an ounce of lemon juice is given in the Navy, thrice in the week, or oftener, and exhibited *ad libitum* should any scorbutic symptoms demand its use; fresh meat, by affording digestible nourishment, is an important adjunct in the treatment. I have also used lemon juice in several severe cases of hæmorrhagic purpura, with the best results, the disease yielding rapidly; and there are good grounds for believing that its employment afterwards, at intervals, materially preserves the health. In acute rheumatism, Dr. Rees advised lemon juice, given in full doses; he considers its good effects due to its decomposition in the system, eliminating such elements as tend to produce uric acid, in the form of urea, and carbonic acid, by supplying them with oxygen; it often affords marked relief, and in other instances, apparently similar, fails where we might expect it to answer. I am satisfied that in certain cases of atonic gout, given with infusion of bark in effervescence, it exerts a decided depurating action.

Effervescing draughts are frequently prepared with lemon juice; f℥ss., of sp. gr. 1·038, is equivalent to about eighteen grains of citric acid, and will saturate

Carbonate of soda, gr. xxxvj.
Bicarbonate of soda, gr. xxj.
Bicarbonate of potash, gr. xxv.
Sesquicarbonate of ammonia, gr. xv.

These draughts are prescribed to relieve febrile thirst, or for allaying nausea and vomiting, and are mildly diaphoretic.

Dose.—For rheumatism or scurvy, from one to four ounces, or upwards, are given during the day.

TINCTURA LIMONIS.—Tincture of Lemon Peel.—Used for flavouring mixtures.

Dose.—fʒss. to fʒj.

Preparation.—Fresh lemon peel, sliced thin, ℥ijss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

SYRUPUS LIMONIS.—Syrup of Lemons.—Added to refrigerant and expectorant mixtures.

Dose.—fʒj. to fʒij.

Preparation.—Lemon juice, strained, Oj.; add fresh lemon peel, ℥ij.; refined sugar, lb. 2½; dissolve the sugar with a steam or water bath, and strain. The product should weigh lb. iijss., of sp. gr. 1·340 (or measure two pints, one fluid ounce, and three quarters.)

SPIRITUS AMMONIÆ AROMATICUS.—Aromatic Spirit of Ammonia.—Is prescribed as an agreeable diffusible stimulant in hysterical affections, and all cases where temporary but active stimulation is required; it is particularly useful in the stupor of intoxication and the nervousness induced by smoking, and for those depressing symptoms caused by improper or poisonous articles of food; in small doses, it is a good addition to astringent and antispasmodic mixtures for infants.

Dose.—For the adult, from fʒss. to fʒij., properly diluted in water or camphor mixture; each fʒj., when of proper strength, will require from f℥jss. to f℥ij. of liquid. For young children the dose will range from five to ten drops, according to age.

Preparation.—Take carbonate of ammonia, ℥viij.; strong solution of ammonia, f℥iv.; volatile oil of nutmeg, fʒiv.; oil of lemon, fʒvj.; rectified spirit, Ovj.; water, Oiij. Mix, and distil Ovij. (Its specific gravity, 0·870 is described as the test of its strength.)

ACIDUM CITRICUM.—Citric Acid ($3\,HO, C_{12}H_5O_{11} + HO$).—A tribasic vegetable acid, obtained from lime or lemon juice, and got in several acidulous fruits, as tamarinds, gooseberries, and cranberries. It forms right-rhombic prisms, with an agreeable acidulous taste, free from odour, soluble in less than its weight of cold water, dissolving more sparingly in rectified spirit; if heated, it undergoes several changes, decomposing, giving off pungent fumes, and leaving a carbonaceous residue. The crystals remain clear at 212° when obtained from evaporating boiling solutions, and become opaque if resulting from spontaneous crystallization.

Preparation.—Lemon juice, Oiv., is mixed with beer yeast, f℥ij., and allowed to stand for two days at a temperature between 60° and 70°; when fermentation ceases, separate the clear fluid from the lees; boil, and while hot add prepared chalk by degrees (℥ivss.) till there is no more effervescence; collect the deposit on a calico filter, and wash with hot water till the filtered liquid passes through colourless; mix the deposit with distilled water, Oij., and gradually add sulphuric acid, f℥ij. fʒiij., previously diluted with distilled water, Ojss., boiling for half an hour, and constantly stirring. Separate the acid solution by filtration; wash the insoluble matter with cold distilled water, and add the washings to the solution; concentrate to sp. gr. 1·21; cool, and after twenty-four hours decant from the crystals of sulphate of lime formed; concentrate further till a film appears, and set aside to crystallize; if necessary, purify the crystals by a second crystallization.

Fermentation destroys any sugar, and precipitates soluble pectin as insoluble pectic acid. The lime is then added at a boiling temperature to form citrate of lime, which deposits, and is afterwards decomposed by dilute sulphuric acid. As sulphate of lime is sparingly soluble in water, much of it is got rid of by concentrating before crystallizing out the citric acid.

Purity.—100 measures of the volumetric soda solution neutralize sixty-seven grains of the crystals dissolved in water; the absence of oxalic acid is shown by its not precipitating with lime water, and of tartaric acid by not affecting acetate of potash solution.

Effects.—Citric acid is employed as a substitute for lemon juice, and in the preparation of the officinal citrates; each half ounce of good lemon juice may be assumed as equal to eighteen grains of citric acid.

ÆGLE MARMELOS.—The Bael Tree.—Is a native of Malabar and Coromandel; its unripe fruit, which is about the size of a large orange, is imported cut in thin slices and dried, the fragments consist of the rind alone, or with adhering portions of the pulp and seeds; the cortex is about a line and a half thick, covered with a smooth, pale-brown or greyish epiderm, and internally, as well as the dried pulp, is brownish-orange or cherry-red; it tastes strongly astringent, containing a modification of tannin; the pulp is mucilaginous, and when recent exceedingly viscid, being used to varnish paintings; and Dr. Royle reports that it is added to mortar when this is required to possess an unusual tenacity. The ripe fruit is asserted to possess much fragrance, and acts as a useful aperient in habitual costiveness.

Botany.—A tolerably large tree, with strong axillary thorns; leaves ternate, oblong, crenulated; flowers white, in small panicles; calyx four to five toothed; petals four or five; stamens thirty to forty; ovary, eight to fifteen celled, with numerous ovules in each cell; fruit baccate, with a hard rind, many-celled, each with six to ten seeds, immersed in tenacious mucus.

Effects.—The half ripe fruit is employed in India as a valuable and efficacious remedy in dysentery and all affections of the intestines accompanied with relaxation; and also in cases of chronic irritation of the mucous membrane of the stomach and bowels; it is alleged not to induce constipation if used by those who are free from disease. Bael is preferably given in decoction, made by boiling down two ounces of the dried fruit slowly with a pint of water to one-fourth; in severe attacks of dysentery three tablespoonfuls of this are administered, every second or third hour, and with less frequency for milder cases; to relieve intestinal irritation, or prevent flatulence, two tablespoonfuls may be taken immediately after meals; a preserve prepared with sugar is also recommended for patients labouring under bowel complaints; the following preparation is officinal:—

EXTRACTUM BELÆ LIQUIDUM.—Liquid Extract of Bael.—Each f℥j. of this is equivalent to an ounce of the dried fruit.

Dose.—From fʒss. to fʒiv., thrice or four times in the day.

Preparation.—Macerate bael, lb. j., in distilled water, Oiv., for twelve hours; pour off the clear liquor; repeat this maceration a second and third time, each with distilled water, Oiv., for one hour; press the marc, and filter the mixed liquids through flannel; evaporate to f℥xiv., and when cold add rectified spirit, f℥ij.

Guttiferæ.—Trees or shrubs, with resinous juice; leaves opposite, coriaceous, entire; flowers occasionally unisexual; sepals two to eight, unequal; petals regular; stamens numerous, often united; ovary one or many celled; fruit dry or succulent; seeds exalbuminous.

CAMBOGIA.—**Gamboge.**—This substance is usually imported from Siam and China; its source is probably a *Garcinia*, as in Mysore and Assam, the "*G. pictoria*" of Roxburgh affords an excellent product; it is got by breaking the small branches, and collecting the yellow juice that exudes. Inferior varieties are imported in irregular shaped masses or cakes, often mixed with sticks and impurities, filled with air cells, and having a dull fracture. The finest pipe gamboge is formed by the exudation concreting inside hollow bamboos; it is in cylindrical rolls; brittle; reddish-brown in colour, becoming darker by exposure to light; has no smell, and slight taste, after a time producing acrid sensations in the fauces; the powder is bright yellow, and whilst pulverizing it irritates the nares; it contains sixty-five to eighty per cent. of resin, or gambogic acid, which is extracted by ether, and got on evaporation in thin orange-red layers; so intense is its colour, that one part will tinge ten thousand of spirit; with acetate of lead it produces a yellow precipitate, and with iron salts a dark brown; gamboge also yields about twenty per cent. of gum, which suspends the resin when rubbed with water, forming an emulsion. Another description of gamboge is procured in Ceylon from the "*Hebradendron gambogioides*," but is only employed for native consumption.

Adulterations.—Wood, stones, and other visible impurities, are easily recognised; the addition of starchy matters is detected by iodine, which renders the yellow solution of gamboge green coloured.

Effects.—Gamboge is a powerful drastic, in full doses operating as an irritant, causing vomiting, tormina, and excessive purging, which is liable to be followed by debility and fatal exhaustion; death is recorded to have resulted after taking sixty grains. It is employed in treating dropsical effusions combined with other purgatives, as jalap and bitartrate of potash, or added to diuretic infusions; it proves of most service for dropsies depending on hepatic obstruction; for when caused by chronic renal disease, the bowels are often in an irritable condition; and I have known some instances in which, when diarrhœa set in, it continued not only until the effusion disappeared, but until the patient sank from the effects of the hypercatharsis. In India it is given as a brisk purgative in cases of enlarged spleen and liver; and from its aperient action is sometimes added to vermifuges for children, but has no special influence over worms.

Dose.—Two to four grains, repeated every three or four hours, until it operates.

PILULA CAMBOGIÆ COMPOSITA.—**Compound Gamboge Pill.**—Employed as an active cathartic, in doses of five to fifteen grains.

Preparation.—Gamboge, Barbadoes aloes, of each, in powder, ℥j.; aromatic powder, ℥j.; mix; add hard soap, in powder, ℥ij., and beat into a mass with syrup.

Vitaceæ.—Climbing shrubs, with tumid joints, and tendrils; leaves simple or compound; flowers small, green, racemose; calyx nearly entire; petals four to five, induplicate; stamens opposite the petals, inserted on a disk; ovary two-celled, ovules erect; fruit a uva; embryo small, in horny albumen.

VITIS VINIFERA.—**The Vine.**—Unripe grapes contain tartaric acid, combined with potash; during the process of ripening fructose or non-crystalline fruit sugar is developed, which gradually uniting with two atoms of water changes into glucose or grape sugar, $C_{12}H_{12}O_{12} + 2HO$; both ferment on the addition of yeast, and become brown-coloured when boiled with potash; grape juice also contains gummy, glutinous, and colouring matters, and deposits during fermentation impure acid tartrate of potash, in masses termed argol. **Raisins** are procured by drying grapes in the sun, or by the heat of ovens; they are used for flavouring.

Sherry.—Is directed for preparing all the medicated wines; it is unnecessary to describe its properties; it affords seventeen to eighteen per cent. of alcohol when of average strength; on no account should inferior varieties of pale wine be substituted for it.

Botany.—A hardy shrub; leaves lobed and sinuated; flowers small, in pendent racemes, opposite the leaves; berry two-celled, four-seeded, often abortive.

ACIDUM TARTARICUM.—**Tartaric Acid** ($C_8H_4O_{10}, 2HO$).—Exists in vegetables in a free state, or more usually combined with lime or potash; in commerce it is always got from bitartrate of potash, deposited during the fermentation of wines; it crystallizes in oblique rhombic prisms, of highly acid taste; colourless, and readily soluble in water or rectified spirit; its aqueous solution by keeping forms a pulpy mass, consisting of a low form of vegetable growth; tartaric acid is bibasic, and has a strong tendency to form double salts. Pasteur has shown that two varieties exist, which act differently on polarized light—the second condition, or racemic acid, rotating to the right. Tartaric acid is distinguished from citric by precipitating with acetate of potash, and both are known from oxalic acid by the latter alone precipitating with cold lime water.

Preparation.—Boil acid tartrate of potash, ℥xlv., with distilled water, two gallons; gradually add prepared chalk, ℥xijss., constantly stirring; when effervescence ceases, add chloride of calcium, ℥xiijss., dissolved in distilled water, Oij.; pour off the liquid from the tartrate of lime, which subsides, and wash it with distilled water until it is rendered tasteless; pour sulphuric acid, f℥xiij., diluted with distilled water, Oiij., on the tartrate of lime; mix well; boil for half an hour, with repeated stirring, and filter through calico. Gently evaporate the filtrate to sp. gr. 1·21; let it cool; separate, and reject the crystals of sulphate of lime which form; again evaporate to a film, and crystallize; lastly, purify the crystals by solution, filtration if necessary, and recrystallizing.

Acid tartrate of potash, with chalk, gives an insoluble tartrate of lime, and soluble tartrate of potash, $2\ (KO, HO, C_8H_4O_{10}) + 2\ CaO, CO_2 = 2\ CaO, C_8H_4O_{10} + 2\ KO, C_8H_4O_{10}$. The tartrate decomposed by chloride of calcium forms chloride of potassium, and another atom of tartrate of lime, $2\ KO, C_8H_4O_{10} + 2\ CaCl = 2\ KCl + 2\ CaO, C_8H_4O_{10}$. This is collected, washed, and decomposed by dilute sulphuric acid, producing sulphate of lime, which precipitates, and tartaric acid. As the sulphate of lime is sparingly soluble, when the fluid is concentrated it is got rid of in great measure before crystallizing out the acid.

Impurities.—Lime would be precipitated with oxalate of ammonia; and oxalic acid, if present, renders solution of sulphate of lime turbid; tartrate of lead—an accidental impurity—is tested by blackening with sulphuretted hydrogen; seventy-five grains dissolved in water require for saturation 100 measures of the volumetric soda solution.

Uses.—Tartaric acid is employed for acidulous and effervescing preparations, and as the acid for soda or Seidlitz powders; its saturating properties are about the same as citric acid, eighteen grains being equivalent to twenty-one of bicarbonate of soda, or twenty-five of bicarbonate of potash.

SOLUTION OF TARTARIC ACID.—Employed to test the soluble salts of potash, causing with them, when added in excess, a precipitate of acid tartrate of potash. This reaction is facilitated by employing concentrated solutions, and some rectified spirit.

Preparation.—Tartaric acid, in crystals, ℥j.; distilled water, f℥viij.; dissolve, and add rectified spirit, f℥ij.; preserve the solution in a stoppered bottle.

Linaceæ.—Herbs, with entire sessile exstipulate leaves; flowers regular; sepals three to five, imbricate; petals three to five, contorted; stamens united at base; ovary three to five celled, with three to five styles; capsules globular; each cell with two seeds, divided by spurious dorsal partitions; no albumen.

LINUM USITATISSIMUM.—**Flax.**—Grows wild, and is extensively cultivated for preparing linen, and for the oil obtained from its seeds; these, termed linseed, are oval, pointed at one end, about a line long; glossy-brown outside, internally white; inodorous, tasting oily and mucilaginous; 100 parts yield from fifteen to twenty-five of oil, chiefly contained in the nucleus, and fifteen of mucilage from the husks; the mucilage is extracted by boiling water; it consists of a soluble portion resembling gum, and an insoluble matter containing nitrogen.

Linseed Meal.—Is got from the ground seeds, freed from oil by expression; it is used for poultices.

Linseed Oil.—Is procured by expressing the pulverized seeds in a screw press; it is a yellow viscid fluid, of peculiar odour; sp. gr. 0·932: soluble in forty parts of alcohol, and if exposed to the air dries into a transparent resinous varnish; hence it is termed a drying oil, and used for painting; this quality is increased by boiling the oil with acetate of lead or litharge; it used to be employed in making Carron oil, or linimentum calcis.

Botany.—An annual; stem erect, one to two feet high; flowers large and blue, in a corymb; capsule globular, containing ten seeds.

INFUSUM LINI.—**Infusion of Linseed**, or flaxseed, is used as a demulcent in catarrhal affections, gonorrhœa, ardor urinæ, and strangury; it is popularly understood that linseed yields a better mucilage with a second infusion than at first.

Dose.—*Ad libitum.*

Preparation.—Linseed, 160 grains; fresh liquorice root, sliced, sixty grains; boiling distilled water, f℥x. Infuse in a covered vessel for four hours, and strain through calico.

CATAPLASMA LINI.—**Linseed Poultice.**—An unnecessary formula, as it is invariably prepared extemporaneously; it should not be spread too thick; this poultice is an excellent vehicle for applying heat, but care must be used that the meal is fresh, as otherwise it irritates tender skins, and causes pustular eruptions.

Preparation.—Linseed meal, ℥iv.; olive oil, f℥ss. Mix; add boiling water, f℥x.; constantly stirring.

OXALIC ACID ($HO, C_2O_3 + 2\,HO$).—This acid exists in plants united with potash, as in sorrel and rhubarb leaves, or with lime in rhubarb root; the latter salt is not uncommon in urine, and by cohering forms the mulberry calculus. Oxalic acid crystals are colourless four-sided prisms, intensely sour, and without odour; they dissolve in twelve parts of cold water, in dry air lose two equivalents of HO, sublime about 300°, and if rapidly heated decompose, yielding water, carbonic oxide, and carbonic and formic acids. Oxalic acid is largely obtained from sawdust; this is made into a paste, with a solution of two parts of caustic soda and one of potash, of sp. gr. 1·35; then heated on iron plates to 400°, for two or three hours, during which it evolves water and inflammable gases; the dark mass, dried without charring, will contain twenty-five to thirty per cent. of oxalic acid; it is dissolved out, and converted into oxalate of soda by adding solution of carbonate of soda, and subsequently precipitated with lime. The acid is obtained in a free state by the addition of dilute sulphuric acid to the oxalate of lime, and crystallized.

Purified oxalic acid should be entirely dissipated at a temperature below 350°; it is distinguished from other vegetable acids by precipitating with cold solutions of lime. It is used to prepare oxalate of ammonia.

Preparation.—Commercial oxalic acid, lb. j.; boiling distilled water, f℥xxx.; dissolve, filter, and crystallize; dry the crystals on filtering paper placed on porous brick.

Effects.—Ten to twenty grains, largely diluted with water, and sweetened, will form a refrigerating drink in febrile affections; a quarter ounce or upwards is decidedly poisonous; this acid is often employed for suicidal purposes, and sometimes taken in mistake for Epsom salt; its intense acid taste should at once distinguish it from the bitter and nauseous sulphate of magnesia; it can be further recognised by burning completely away, and by reddening ordinary writing ink. In a few instances it has proved fatal with great rapidity, destroying life within ten minutes; these exceptional cases occur when excessive doses are used; it appears to alter the chemical composition of the blood, and powerfully affects the heart; more often death is protracted for a few hours, and even days may elapse, the result then ensuing from secondary irritation and exhaustion. The leading symptoms observed are, intense acid taste, gastric pain, frequent vomiting of glairy mucus and altered blood, clammy sweats, languor, debility, and convulsions, or a state of profound collapse; after death, the stomach may appear white and softened as if scalded, or intensely vascular, blackened, and seemingly gangrenous; perforation is a very rare occurrence.

Antidotes.—Magnesia or chalk is given to form inert oxalates; the compounds with soda and potash are soluble, and poisonous. Vomiting should be encouraged, or the stomach pump carefully used.

Zygophyllaceæ.—Herbs, or trees; leaves opposite, stipulate, usually pinnate, not dotted; sepals four to five, convolute; petals clawed, imbricate; stamens eight to ten; ovary four to five celled, style simple; fruit usually a capsule, opening by four to five valves; seeds usually albuminous; embryo green.

GUAIACUM OFFICINALE.—Guaiac.—Grows in the West Indian Islands, particularly Hayti, and the south side of Jamaica; the wood, termed *Lignum vitæ*, is imported in large logs, covered with a thick grey bark, heavier than water, sp. gr. 1·33; the alburnum or sap wood is pale yellow—the older heart wood darker and greenish-brown, from the deposition of resinous matter; its woody fibres are remarkable, each layer crossing the preceding one diagonally. For medical use it is rasped, or turned into coarse powder, which has the peculiar acrid taste and odour of the resin, and assumes a bluish-green colour if heated with solution of corrosive sublimate; when burned, it emits a fragrant odour; and, according to Tromsdorff, contains twenty-six per cent. of resin and 0·8 of a bitter pungent extractive substance. The wood boiled in water is occasionally used for chronic rheumatism; it also enters into compound decoction of sarsaparilla; its effects are slight.

RESINA GUAIACI.—Guaiac Resin.—Or gum guaiacum, is imported in large friable masses, or semitransparent lumps, covered with grey dust, mixed with fragments of wood, bark, and other impurities; its colour is greenish-brown or olive-green externally, in thin fragments being nearly translucent; those parts not exposed to the air are reddish-brown, resembling common resin; it softens slightly if masticated; has little taste, producing an acrid sensation in the throat; dissolves freely in alcohol, ether, and alkaline solutions; its sp. gr. is 1·2; in powder, subjected to the more refrangible rays of light, it absorbs oxygen, and becomes greenish-blue; if tincture of guaiacum dropped on paper is treated in this manner, the colour can be removed by gentle heat, or on exposure to the less refrangible portion of the spectrum; Deville considers that it contains two resinous acids, one of which, guaiacic acid, $HO, C_{12}H_7O_5$, may be obtained from its alcoholic solution in crystalline needles, soluble in water. It is procured by exudation from the tree in tears; these are seldom met in commerce; the wood, cut into billets, and bored lengthwise, if burned at one end will yield the resin, which flows out at the opposite extremity; but more probably it is got by boiling the wood in salt and water, and removing the gum guaiacum as it rises to the surface.

Botany.—An evergreen tree, thirty to fifty feet high; stem crooked, wood hard, heavy, and remarkable for the direction of its fibres, each layer crossing the other diagonally; leaves evergreen, bijugate; flowers eight to ten, from the axils of the upper leaves, each on a long single-flowered stem; sepals five, oval; petals five, pale blue; fruit, a fleshy yellow capsule.

Adulterations.—Pine resin is stated to be sometimes present; it is seldom met, and is tested by mixing a spirituous tincture with water, adding excess of potash; if pure, the guaiac solution becomes clear, the pine resin causing turbidity.

Tests.—Nitric acid applied to the heart wood gives a bluish-green colour; guaiac resin dissolved in spirit strikes a bright blue with the gluten of a slice of raw potato or carrot.

Effects.—The resin is stimulant, diaphoretic, and alterative, causing increased secretion of the skin and kidneys; excessive doses will excite burning in the throat, vomiting, purging, and febrile disturbance; it is prescribed for chronic rheumatism, occurring in debilitated or aged persons, and in those suffering from syphilitic or scrofulous taint; in atonic gouty affections it occasionally proves of service, and some consider it useful as a preventive of the attacks; combined with ammonia, it is used in obstructed and painful menstruation; it is best suited for cases of neuralgic type, free from congestive or inflammatory symptoms; it was originally introduced as a specific for syphilis, but is now relied on only for its sudorific and alterative effects in treating late secondary symptoms, particularly periosteal and wandering rheumatic pains.

MISTURA GUAIACI.—Guaiac Mixture.—Prescribed for chronic or subacute rheumatism, and for cutaneous eruptions in strumous individuals.

Dose.—f℥ss. to f℥ij., taken twice or thrice daily.

Preparation.—Rub guaiac resin, in powder, ℥ss., with refined sugar, ℥ss., and powdered gum arabic, one-quarter of an ounce, gradually adding cinnamon water, Oj.

TINCTURA GUAIACI AMMONIATA.—Ammoniated Tincture of Guaiac.—Used for chronic rheumatism and neuralgic dysmenorrhœa.

Dose.—fʒj. to fʒij.; as it precipitates with water, it is best given in treacle, mucilaginous emulsion, or milk.

Preparation.—Macerate guaiac resin, in powder, ℥iv., for seven days, with aromatic spirit of ammonia, Oj. Filter, and add sufficient aromatic spirit to make Oj.

Rutaceæ.—Herbs, or trees, with exstipulate dotted leaves, and perfect flowers; sepals four to five; petals four to five, or none; stamens definite, on the outside of a cup-shaped disk; ovary three to five lobed; style single, sometimes divided near the base; fruit capsular, often separating when ripe; seeds one or two in each carpel. The Ruteæ have albuminous seeds; the Barosmeæ are exalbuminous.

RUTA GRAVEOLENS.—Rue.—Is a common garden plant; it has a strong disagreeable odour, and acrid bitter taste; the fresh leaves abound in oil glands; when in full vigour they will redden and even vesicate the skin, but their acridity is diminished by drying; before flowering, lb. xij. of the leaves produced fʒij. of the essential oil; and when the capsules were ripe, nearly f℥j. was obtained.

Oil of Rue.—Is got by distilling the recent herb with water; it is pale yellow, and has the distinctive odour and acrid taste of the plant; sp. gr. 0·911; its composition is $C_{28}H_{28}O_3$.

Botany.—A branching shrub; leaves blueish-green; leaflets thickish, tapering towards the base; flowers yellow, in a terminal corymb; the flower that first opens has usually five sepals and petals, and ten stamens, the others four petals and sepals, and eight stamens; the anthers move in turns to the pistil, and, having shed their pollen, retire; fruit roundish, warty, four-lobed, each lobe opening into two valves.

Effects.—Rue is a stimulating antispasmodic; its reputed properties as an emmenagogue lead to its occasional use for causing abortion; in some instances which are recorded, it appears to have acted as a narcotic irritant, the symptoms observed being epigastric pain, violent and repeated vomiting, febrile symptoms, giddiness, tottering and irregular movements, resembling intoxication, confused vision, stupor, with slow and feeble pulse, and after some days miscarriage has ensued. In medicine the oil is prescribed to relieve flatulent colic, especially for infants, given either by the mouth, or added to purgative enemas; it is sometimes used in hysterical affections, and is an effectual vermifuge for the oxyurus when combined with brisk purgatives; given with preparations of aloes and chalybeates, it is of service for treating cases of amenorrhœa depending on chlorosis.

Dose.—Of the oil, two to five drops, made into emulsion, or smaller quantities in pill masses; for infants, it is rubbed up with sugar, and then added to water, in the proportion of two to four drops to each f℥j., of which the average dose will be half a teaspoonful, or more.

BUCCO.—**Barosma.**—The dried leaves, known as buchu or bucco, derived from several species of barosma, are imported from the Cape of Good Hope, where they are much used by the natives for chronic gastric, and urinary diseases; they are coriaceous and smooth, beset with oil glands, and have a peculiar aromatic odour, resembling a mixture of rue and peppermint; their taste is warm, bitterish, and fragrant. The serrated edges of the leaf and its equal sides at once distinguish it from senna, independent of its smell; buchu contains a pale yellow volatile oil, which is the chief source of its medical properties; a bitter extractive matter termed diosmin, with gum, resin, and chlorophylle.

Botany.—Several shrubs yield buchu. They have opposite smooth dotted leaves; flowers axillary and stalked; calyx five cleft; disk lining the bottom of the calyx with a very slight rim; petals five; stamens ten, half of them fertile, the others like petals; fruit composed of five cocci, with glandular dots at the back. Among the species are:—

Barosma Betulina.—Leaves obovate, about three-quarters of an inch long, with recurved truncated apex, and sharp cartilaginous spreading teeth; flowers pink and solitary.

Barosma Crenulata.—Leaves oval, lanceolate, obtuse, minutely crenated, five-nerved, about an inch long; flowers bluish.

Barosma Serratifolia.—Leaves linear lanceolate, tapering, sharply and finely serrated, three-nerved, one to one and a-half inches long; flowers white.

Effects.—Buchu acts as a stimulating diuretic, and apparently as a mild direct tonic on the kidneys and urinary passages; it is prescribed in chronic diseases of the bladder with excessive mucous discharge, which it frequently improves, relieving at the same time the irritable condition of the bladder itself; for this purpose it is combined with dilute acids, anodynes, as hyoscyamus, and opium, or alkalies, as potash; it causes increased secretion of urine, to which it imparts its peculiar odour, and requires to be persevered in for some time; it has also been recommended for dyspepsia and chronic rheumatism, and occasionally proves serviceable in gleet.

TINCTURA BUCCO.—**Tincture of Buchu.**—Usually added to the infusion.

Dose.—fʒj. or fʒij.

Preparation.—The bruised leaves, ʒijss.; proof spirit, Oj., prepared by maceration and percolation, like tincture of aconite; to yield Oj.

INFUSUM BUCCO.—**Infusion of Buchu.**

Dose.—f℥j., or f℥ij., three or four times in the day.

Preparation.—The bruised leaves, ℥ss.; boiling distilled water, f℥x. Infuse for one hour in a covered vessel, and strain.

GALIPÆA CUSPARIA.—**Cusparia, or Angostura Bark.**—Is imported from tropical South America, in pieces of various lengths, half a line to a line thick, usually curved and pared away at the edges, covered externally with a mottled grey or yellowish-white epiderm, easily scraped off; the bark itself is fragile, breaking with a short resinous fracture, compact, yellowish-brown, having a peculiar unpleasant odour, most strong when fresh, tasting bitter, aromatic, and slightly acrid; it yields a volatile aromatic oil, with resin, gum, and a bitter neutral principle, angosturin, which crystallizes from the alcoholic tincture when evaporated.

Botany.—A forest tree, sixty to eighty feet high; leaves trifoliate, fragrant, on long petioles; flowers in axillary racemes, almost terminal; white, with fascicles of hairs seated on glandular bodies; stamens six, two fertile; seed solitary. It is probable that the *G. officinalis*, a tree never exceeding twenty feet high, growing about the Orinoco, yields part of the bark of commerce.

Adulteration.—Early in this century a false angostura bark was imported, which caused serious accidents; this is now known to have been the bark of *Strychnos nux vomica*, which, when young, closely resembles angostura; its distinctive characters are, its intense bitter taste, different from the aromatic bitter of cusparia; and with nitric acid it strikes a blood-red colour, if applied to its inner surface, from the brucia which it contains. When strychnos bark is old, it becomes covered with rust-red warty growths, and cannot be confounded with angostura. The false bark is never met at present in commerce.

EFFECTS.—Cusparia is aromatic bitter, useful in dyspepsia, and other diseases where tonics are required. In tropical America it is greatly employed in intermittent and malignant bilious fevers, as a febrifuge, in place of cinchona; also for dysenteric attacks and dropsies; full doses will nauseate and purge.

INFUSUM CUSPARIÆ.—INFUSION OF CUSPARIA.—Used as a tonic, in doses of f℥ss. to f℥ij.

PREPARATION.—The bark, in coarse powder, ℥ss.; distilled water, at 120°, f℥x. Infuse in a covered vessel for two hours, and strain.

SIMARUBACEÆ.—Trees, or shrubs, with bitter wood; leaves alternate, exstipulate, without dots, usually compound; sepals four to five; petals imbricate; stamens eight to ten, rising from hypogynous scales; ovary stalked, four to five lobed; fruit of drupes round a receptacle, each with one pendulous exalbuminous seed.

PICRÆNA EXCELSA.—QUASSIA.—Is imported in logs from Jamaica, seldom exceeding a foot in diameter, frequently covered with portions of a dark grey smooth bark, which is brittle and easily detached; the wood is white, intensely bitter, and inodorous, but becomes yellow by exposure; it is chipped or rasped, for use; its virtues reside in a crystallizable bitter neutral principle, quassite, obtained from a watery extract of the wood by alcohol; when heated, it melts like a resin, and is only sparingly soluble in water, if perfectly pure. The substance originally employed as quassia was the produce of the *Quassia amara* of Surinam, which is now never obtained in commerce.

BOTANY.—A tree, fifty to one hundred feet high, with smooth dark grey bark; leaves pinnate, leaflets four to eight pair, stalked, oblong, acuminate; raceme axillary; flowers small, yellowish-green, polygamous; drupes three, one alone ripening into a black shining nut, like a pea.

EFFECTS.—Quassia possesses all the properties of a simple bitter; it is prescribed as a tonic in dyspepsia, particularly for gouty patients, and after attacks of delirium tremens; the infusion forms a useful vehicle for chalybeates, containing no tannin, and is often employed with saline cathartics or antacids. When sweetened, it forms a well-known fly-poison, but appears to exert no injurious influence on man.

INFUSUM QUASSIÆ.—Infusion of Quassia.—Is made by a process adopted from the U. S. Pharmacopœia; the cold water yields a clearer infusion.

Dose.—f℥ss. to f℥j.

Preparation.—The wood, in chips, gr. lx.; cold distilled water, f℥x. Infuse for half an hour, and strain.

EXTRACTUM QUASSIÆ.—Extract of Quassia.—Is dark brown, or black, and excessively bitter; it is used to make other substances into pill, or given itself when bitter infusions are objectionable.

Dose.—About five grains.

Preparation.—Macerate quassia, in moderately fine powder, lb. j., with distilled water, f℥viij., for twelve hours; then exhaust by percolation; evaporate the liquid; filter before it becomes too thick, and again evaporate by a water bath to a proper consistence.

SIMAROUBA BARK.—Is no longer officinal, though sometimes used in practice; it is obtained from *Simarouba amara*—a tree found in the West Indies, where it is termed the mountain damson. The bark is imported in long folded pieces; it is flexible, tenaceous, and fibrous, with a rough whitish-yellow epiderm, paler inside, without smell, and having a bitter taste; it contains some volatile oil, resin, and a bitter principle, which resembles that found in quassia.

Effects.—Its properties appear to be those of a simple bitter; in large doses it is said to cause vomiting and purging; it was formerly celebrated for treating dysentery and obstinate diarrhœa, but has no influence over these affections, beyond acting as a gentle tonic. It is best given in infusion, prepared by pouring boiling water, Oj. on bruised simarouba, ℥ss., and straining, after infusing for an hour.

Dose.—Of the infusion, f℥ss. to f℥j., three or four times in the day.

CALYCIFLORAL EXOGENS.

ANACARDIACEÆ.—Trees, or shrubs, with resinous acrid juice, often blackening when dry; leaves exstipulate, alternate; flowers small, sometimes unisexual; sepals three to five, united; petals three to five, imbricate; stamens usually definite; ovary one-celled; styles three; ovule single, with a funicle from the base of the cell; fruit indehiscent; seed exalbuminous.

PISTACHIA LENTISCUS.—MASTICH.—This shrub, or small tree, is a native of the Levant; mastich is obtained chiefly from Scio; it exudes from incisions made in the bark of the trunk and branches, from which the juice slowly exudes, and hardens into tears upon the stem, or drops on the ground, concreting in irregular masses; the tears are most valued; they are round or oval, smooth, semitransparent, of pale yellow colour, dry and brittle, covered with a light powder from attrition against each other; when rubbed or heated it becomes fragrant, softens in the mouth, and has an agreeable resinous odour and taste; spirit of wine dissolves about ninety per cent. of mastichic acid; the insoluble residue is termed masticin; it freely melts in ether, chloroform, or oil of turpentine.

BOTANY.—A shrub, seldom exceeding twelve feet in height; leaves abruptly pinnate, evergreen; pinnæ eight to twelve pair; flowers diœcious, small, in axillary racemes, near the ends of the branches; fruit small, roundish, of brownish-red colour, one-seeded.

USES.—It is prescribed with thrice its weight of aloes, occasionally, as a dinner pill; its effects appear unimportant; dissolved with camphor in chloroform, it is used on cotton wool to stop carious teeth, having previously well dried and cleaned the cavity; it excludes air, and protects the diseased surface from the pressure of food.

AMYRIDACEÆ.—Trees, or shrubs; leaves compound, occasionally stipulate and dotted; calyx three to five cleft; petals three to five, valvate; stamens six to ten; ovary one to five celled, surrounded by an annular disk; ovules in pairs; fruit dry and hard; exocarp splitting into valves; seeds anatropal, exalbuminous.

BALSAMODENDRON MYRRHA.—MYRRH.—This shrub is at least one of the sources of myrrh; it and allied species are natives of Arabia, and abound in Abyssinia, from whence much of the myrrh of commerce is obtained; it exudes from the bark like common gum, and becomes dark-coloured and hard by drying. The best quality, termed Turkey myrrh, is in tears or irregular fragments, covered with a fine dust; its colour varies from pale yellow to reddish-brown; it breaks easily, and has a semitransparent appearance, often marked with opaque striæ; its odour is peculiar, and considered agreeable; it tastes bitter and aromatic; sp. gr. about 1·36. An inferior variety, consisting of small grains or tears, is imported in chests, or mixed with the better pieces, which is distinguished as East Indian myrrh; it varies in colour from pale yellow to deep brown; this is often mixed with pieces of bdellium and other resinous gums, and fragments of gum arabic.

Myrrh affords 2·5 per cent. of aromatic volatile oil, myrrhol, and thirty to forty of resin, the residue consisting of gum, three-fourths of which dissolve in water, the other fourth resembling tragacanth.

BOTANY.—A small tree, with spiny abortive branches, covered with whitish-grey bark; wood yellowish-white, odorous; leaves with three obovate obtuse leaflets; fruit acuminate, larger than a pea, on a short stalk, and surrounded by a four-toothed calyx.

ADULTERATIONS.—Are difficult to detect in powdered myrrh; Righini states that, if rubbed with an equal quantity of muriate of ammonia, and fifteen times its weight of water gradually added, it dissolves quickly and entirely when pure.

EFFECTS.—Myrrh is a tonic and mild stimulant; it is seldom prescribed unless in combination with bitters, chalybeates, or aloetic preparations; it is of service in relaxed states of the system, with feeble digestion and circulation, and, like other gum resins, will relieve chronic catarrh, and check excessive mucous secretion. It was formerly considered to exert a special influence over the uterus, and is still exhibited in amenorrhœa, but only as an adjunct to more powerful remedies; its beneficial effects, if any, must be ascribed to its tonic action on the general health. Myrrh is added to gargles for ulcerated sore throat, and used as a wash for aphthous affections of the mouth, and for soft and spongy conditions of the gums; its powder is constantly mixed with dentifrices for its odour, and is thought to preserve the teeth in a healthy condition.

TINCTURA MYRRHÆ.—TINCTURE OF MYRRH.—Is sometimes added to stimulating expectorants, or emmenagogue mixtures; more often it is used in gargles, or for tooth washes, and occasionally applied to dress foul and indolent ulcers; when diluted with water, it renders the fluid turbid, but throws down no precipitate.

DOSE.—fʒss. to fʒij.

PREPARATION.—Myrrh, in coarse powder, ℥ijss.; proof spirit, Oj., prepared by macerating and percolation, similar to tincture of aconite; to yield Oj.

ELEMI.—Several fragrant resinous products are known under this name; a variety, imported in hollow reeds, was formerly obtained through Holland, probably from the Phillipines, which is considered to have been the produce of a "*Canarium*." Brazilian elemi is stated to be obtained by incising the stem of an "*Icica;*" it is contained in cases weighing two or three hundred weight; its properties are similar to that which is described in the Pharmacopœia as being imported through Manilla, and which is ascribed to *Canarium commune;* this is in large masses, covered with a monocotyledonous leaf; when freshly broken, soft and unctuous, strongly fragrant, with a powerful pepper odour, smelling of fennel and lemon; its colour is yellowish-white, with interspersed greenish portions; it becomes harder through age; its taste is bitter and terebinthinate; I have found fragments of red cinchona bark imbedded in it. Elemi is nearly perfectly soluble in rectified spirit; its properties are analogous to those of the turpentines; it is only used externally in elemi ointment.

UNGUENTUM ELEMI.—Elemi Ointment.—Is employed as a stimulating application to chronic ulcers, and when diluted with oil of turpentine constitutes the well-known warm dressing which is melted and applied on lint to parts from which sloughs are separating, and bed sores, to increase the formation of granulations.

Preparation.—Melt elemi, one-quarter of an ounce; simple ointment, ℥j.; strain through flannel, and stir until cooled.

Leguminosæ.—Herbs, or trees with alternate, usually compound, stipulate leaves; calyx five cleft; petals papilionaceous or regular; stamens variable, distinct, or united in bundles; fruit a legume; seeds exalbuminous. Its suborders are—

Papilionaceæ.—Petals papilionaceous, imbricate; the vexillum external. It includes—

Myrospermum Pereiræ,
„ toluiferum,
Sarothamnus scoparius,
Glycyrrhiza glabra,
Astragalus verus,
Pterocarpus santalinus,
„ marsupium,
Indigofera tinctoria.

Cæsalpineæ.—Petals imbricate; vexillum internal, including—

Hæmatoxylum Campeachianum,
Tamarindus Indica,
Cassia fistula,
Cassias (yielding senna),
Copaifera multijuga.

Mimoseæ.—With valvate petals, containing—

Acacias (affording gum).
Acacia catechu.

MYROSPERMUM PEREIRÆ.—The Quinquino Tree.—Which yields balsam of Peru, is a native of the San Sonate coast of San Salvador; the balsam is obtained by the Indians, who make incisions into the tree two or three inches wide and three or four inches long, raising the bark, and applying cotton rags to the wound; by lighting fires round the stem the balsam flows out, and is afterwards separated from the rags on boiling them in water, fresh incisions being made higher up until the tree is exhausted. Balsam of Peru is a thick fluid, of the consistence of treacle, dark reddish-brown, semitransparent, of agreeable aromatic odour, and bitterish acrid taste, causing, when swallowed, a burning sensation in the throat; sp. gr. 1·15; it dissolves in five parts of rectified spirit; on analysis it yields cinnameine, a fragrant oil, cinnamic acid, $HO, C_{18}H_7O_3$, formerly mistaken for benzoic acid, and a quantity of resin; this constantly increases in the balsam, being produced by the union of the oil with water, which is present in considerable amount.

BOTANY.—A tree, with lofty stem, smooth ash-coloured bark, and spreading branches; leaves petiolate, unequally pinnate; leaflets five to eleven, oval oblong, coriaceous, with marginate point, exhibiting pellucid spots along the veins; flowers in axillary racemes; calyx campanulate; petals white; legumes pale yellow, four inches long, forming a samara with thick wings, not veined; one or two seeded.

EFFECTS.—Its properties are similar to other stimulating gum resins; it was formerly employed in phthisis, and is still sometimes used for chronic catarrh and mucous discharges; externally it is applied alone, or in ointment to chronic indolent ulcers and to phagedenic and sloughing sores.

DOSE.—Ten to forty drops, suspended with mucilage or yolk of egg.

MYROSPERMUM TOLUIFERUM.—THE TOLU TREE.—Is a native of New Grenada; the balsam is obtained by incising the stem, and receiving the liquid exudation in pots and small gourds; it was formerly imported in brittle masses resembling resin, but is now usually met of a soft consistence like thick honey; it is reddish-brown, translucent, having a highly fragrant odour, and a warm sweetish and pungent taste; when heated it melts, giving off an agreeable perfume if burned; it dissolves in rectified spirit and ether; its constituents are resin, cinnamic acid, and a volatile oil, tolene, which is isomeric with turpentine.

BOTANY.—It differs from M: Pereiræ, in having thin membranous obovate leaflets, the terminal one largest.

USES.—For flavouring expectorant mixtures; like other balsams, it may be given in chronic catarrhs and mucous discharges.

DOSE.—Ten to thirty grains, in emulsion.

SYRUPUS TOLUTANUS.—**Syrup of Tolu.**—Added to mixtures for its flavour.

Dose.—fʒj. to fʒij.

Preparation.—Boil balsam of tolu, 1¼ ounce; distilled water, Oj., for half an hour, in a lightly covered vessel, stirring occasionally; remove from the fire, and add distilled water to make f℥xvj. Filter when cool; add refined sugar, lb. ij., and dissolve with a steam or water bath. The product should weigh lb. iij.; sp. gr. 1·330. (To measure Oj., f℥xvj.)

TINCTURA TOLUTANA.—**Tincture of Tolu.**—A stimulating expectorant, principally used to flavour other remedies.

Dose.—fʒj., mixed with mucilage, to prevent the resin from depositing.

Preparation.—Tolu balsam, ℥ijss.; rectified spirit, Oj.; macerate for six hours, or until dissolved. Filter, and add rectified spirit to make Oj.

SAROTHAMNUS SCOPARIUS.—**The Common Broom.**—Is a well-known indigenous shrub; its fresh green tops have a peculiar strong odour when bruised, and nauseous bitter taste. Dr. Stenhouse has separated from them two principles—one a volatile narcotic base, intensely bitter, crystallizing in yellow stellate crystals, termed spartine, $C_{15}H_{13}N$; it appears to have narcotic properties; the other, scoparin, is a green deposit, which falls from concentrated decoction of broom, after resting for a few days; this is alleged to be a powerful and certain diuretic, in five-grain doses. The fresh, and dried tops are officinal.

Botany.—A shrub, three to six feet high; branches long, straight, and angular; leaves ternate, stalked, the upper ones simple; flowers large, bright yellow, axillary; stamens monadelphous; legumes dark brown, hairy at the margins, many-seeded.

Effects.—Broom is one of our most valued diuretics; it is given with vegetable medicines of the same class, or the diuretic salts of potash, for removing chronic dropsical effusions; when there is excessive anasarca, diuretics are often powerless until the system is relieved by mechanical means, as acupuncture; and after a portion of fluid is discharged, the rest becomes rapidly absorbed. Broom is injurious in acute renal affections, and is stated to be of little use for thoracic dropsy, complicated with pulmonary disease. In large doses it operates as a cathartic and emetic.

DECOCTUM SCOPARII.—**Decoction of Broom.**—Employed usually with other diuretics, as acetate of potash.

Dose.—f℥ss. to f℥ij., every three or four hours.

Preparation.—The dried broom tops, ℥ss.; distilled water, Oss.; boil for ten minutes in a covered vessel, and strain off f℥viij.

SUCCUS SCOPARII.—Juice of Broom.—Fresh broom tops will yield from one-third to one-fourth their weight of juice when strongly pressed; hence fʒj. of the succus is equal to f℥iv. of the decoction.

Dose.—fʒss. to fʒj.

Preparation.—Take the fresh tops, lb. vij.; bruise in a stone mortar; express the juice, and to every three measures of it add one of rectified spirit; set aside for seven days, and filter; keep in a cool place.

GLYCYRRHIZA GLABRA.—Liquorice—Is obtained from this plant, and from *G. echinata*, natives of southern Europe, and largely cultivated in Italy for preparing the juice. The fresh roots, or underground stems, are got from plants grown in the Kent medical gardens; they are long, pliable, and succulent, of yellow colour and greyish-brown on the outside, with faint earthy odour; usually about the thickness of a finger, and two to three feet in length; their sweet principle, glycirrhizin, is not a true sugar, being incapable of fermentation; its proper solvent is alcohol; it is yellow, transparent, and non-crystalline, and has a strong tendency to combine with bases.

Botany.—A perennial herb; stems erect, smooth, four to five feet high; leaves unequally pinnate, viscid beneath; flowers purplish, in axillary racemes; stamens diadelphous; legume smooth, compressed, three or four seeded.

Effects.—Liquorice is employed as a demulcent, and added to preparations for its sweet taste. The powder is used to involve pills, and give them proper consistence. It is a good addition in prescribing creasote in the form of pill, and suspends turpentine perfectly in mixture. When powdered, the dark cortex should be removed, being slightly acrid.

EXTRACTUM GLYCYRRHIZÆ.—Extract of Liquorice.—A superior description of extract is prepared from the roll liquorice of commerce, by dissolving its soluble portions in cold water, and evaporating. The officinal extract is used for making tincture and decoction of aloes, and opium lozenges; it is also of service to form extemporaneous pill masses.

Dose.—*Ad libitum.*

Preparation.—The root, in coarse powder, lb. j.; macerate with distilled water, f℥viij., for twelve hours; pack in a percolator, and exhaust with distilled water; heat the product to 212°; strain through flannel, and evaporate in a water bath to proper consistence.

ASTRAGALUS VERUS.—Tragacanth.—Is the produce of this and several other species of *Astragali* growing in Asia Minor and Persia, all the varieties with thorny petioles being stated to furnish gum. It exudes from natural fissures in the bark, springing from the cambium and medullary rays, and abounds in hot seasons, after heavy night dews. The best description forms flat, wrinkled flakes of white or pale yellow colour, tough, elastic, and difficult to powder unless thoroughly dried, or heated to 120°. An inferior variety, less valued, occurs in small vermiform darker coloured fragments. It consists, according to Guibourt, of a peculiar gelatinous matter, mixed with some starch and woody fibre. Examined microscopically by Kutzing, it was found composed of cells with thick walls, often having numerous concentric layers, and filled with starch globules. Its composition is usually stated to be fifty-seven per cent. of a soluble gum, resembling gum arabic, but which does not precipitate with silicate of potash. The residue, analogous to gum bassora, absorbs water, though it is not soluble in it.

Botany.—Herbs, or shrubs; calyx five-toothed; corolla with an obtuse keel; stamens diadelphous; legume two-celled, or half two-celled, from the lower suture turning inwards.

A: **Verus.**—A small shrub, covered with spines, the remains of old petioles; leaflets hispid, eight or nine pairs; flowers yellow, axillary, in clusters.

Effects.—It is used to prepare a cheap mucilage, and largely employed by the confectioner for making lozenges, for which it is better suited than gum arabic. Its powder is occasionally used to suspend heavy drugs, as calomel and trisnitrate of bismuth.

MUCILAGO TRAGACANTHÆ.—Mucilage of Tragacanth.—This gum forms a thicker mucilage than sixteen times its weight of gum arabic, and is probably of equal use as a demulcent. The solution, by long keeping, will turn sour. Tincture of iodine added to it gives a violet tint to the gelatinous mass, but when the gum is adulterated with starch it strikes a deep blue colour.

Preparation.—Tragacanth, gr. c.; boiling distilled water, f℥x.; macerate for twenty-four hours; triturate, and strain through calico.

PULVIS TRAGACANTHÆ COMPOSITUS.—Compound Powder of Tragacanth.—Employed for suspending heavy powders.

Dose.—Ten to thirty grains, or upwards.

Preparation.—Tragacanth, gum arabic, starch, of each, in powder, ℥j.; refined sugar, in powder, ℥iij. Mix.

PTEROCARPUS SANTALINUS.—**Red Sanders or Sandal Wood.**—Is imported in dense billets, dark-brown externally; variegated inside with dark and lighter red rings if cut transversely; it is compact, and capable of receiving a fine polish; has a faint odour, and slight astringent taste; its colouring matter is extracted by rectified spirit and alkaline solutions, which change it to a violet tint; Pelletier terms this substance santalin; the wood contains about seventeen per cent. of it. The sandal tree is a native of the mountainous districts of Ceylon and Coromandel; it possesses no medical properties, and is employed solely for a colouring agent.

Botany.—A large tree, with alternate branches, and petiolate ternate leaves; leaflets roundish, retuse, glabrous; flowers yellow, in axillary racemes; legume stalked, suborbicular, with a membranous wing, indehiscent, one-seeded.

Used—In compound tincture of lavender.

PTEROCARPUS MARSUPIUM.—**Gum Kino,**—of commerce is obtained from this source; the tree is a native of the Malabar coast; the gum flows from longitudinal incisions made in the bark whilst the plant is flowering; the fluid that exudes is received on a broad leaf, which conveys it into vessels, where it hardens by exposure to the air, until fit for exportation. Kino occurs in small brittle angular fragments, seldom so large as a pea, of glistening reddish-brown colour, in small pieces ruby-red and translucent; it is odourless, intensely astringent, and colours the saliva; water partially dissolves it, forming a decoction, which becomes turbid on cooling; in alcohol it is nearly all soluble; the tincture is liable to gelatinize when kept—no satisfactory explanation has been offered for this change. The composition of kino resembles that of catechu; the mimotannin which it contains gives a greenish precipitate with persalts of iron.

Botany Bay Kino.—Is the produce of different eucalypti, chiefly *E. resinifera*, or iron bark, which when wounded affords a large quantity of astringent gum; it occurs in tears or irregular brittle masses, almost black coloured, but ruby-red and transparent in thin fragments; digested with cold water or rectified spirit, it swells, becoming gelatinous, and forming astringent solutions.

Botany.—P: Marsupium.—A lofty tree; its bark outside is brown, inside red, fibrous, and astringent; leaflets alternate, deep green, shining, three to five inches long; petals white, tinged yellow; stamens ten, united below in two parcels, of five each above; legume long-stalked, three-fourths orbicular, the upper side straight, with a wavy membranous border; seed solitary.

Effects.—A powerful astringent, used in diarrhœa, with chalk mixture and opiates; for chronic dysentery when astringents are indicated, and for passive hæmorrhages from the intestines or uterus; and sometimes added to gargles for relaxed sore throat.

TINCTURA KINO.—Tincture of Kino.—Should be preserved from the air, as it is liable to gelatinize.

Dose.—fʒj. to fʒij., given with other astringents.

Preparation.—Macerate kino, in moderately fine powder, ℥ij.; rectified spirit, Oj., for seven days. Filter, and add rectified spirit to make Oj.

PULVIS KINO CUM OPIO.—Powder of Kino and Opium.—An anodyne astringent, useful in diarrhœa and some cases of mucous catarrh of the stomach.

Dose.—Four to thirty grains, for the adult; it contains gr. j. of opium in gr. xx.

Preparation.—Mix kino, 3¾ ounces; opium, one quarter of an ounce, and cinnamon, ℥j., all in powder; pass through a fine sieve, and preserve in a stoppered bottle.

PHYSOSTIGMA VENENOSUM.—The Eseré, or Calabar Bean—Deserves insertion in the list of our remedial agents; it is employed for judicial purposes as an ordeal in Africa in the district of Old Calabar, and those only who escape its rapid dangerous effects are considered guiltless. The bean is oval, about an inch or more in length, and three-fourths of an inch wide, consisting of a hard tough integument, light or deep-brown, darker when old, somewhat shining and rough, having a sulcus with elevated paler edges running along its convex border, ending in a rounded termination, pierced by the foramen; within is a large embryo, with two fleshy brittle cotyledons; its odour is peculiar, resembling that of laburnam seeds; in this part the poisonous property resides; each bean weighs, on an average, about sixty grains. The plant which produces it grows along the margins of streams, climbing on the trees and bushes; the ripe beans frequently drop into the water, and are carried down to Calabar in considerable quantity, floating on the river. Rectified spirit extracts the active principle; it also dissolves in glycerine; an alkaloid is stated to exist in it, which requires further investigation.

Botany.—A climbing herb, of large size; root spreading, with numerous fibrils and small tubers; flowers in axillary racemes; corolla papilionaceous, purplish, veined with pale pink; stamens ten, diadelphous; stigma covered by a remarkable hood; legume dark brown, and straight, seven inches long; seeds two to three, separated by a woolly substance.

Effects.—Fatal doses cause rapid spreading paralysis of the voluntary muscles, and asphyxia—the heart continuing to pulsate, though slowly, and the pupils becoming contracted; excessive doses completely paralyze the heart, but sensation and consciousness appear to remain intact; death ensues rapidly, within thirty to forty minutes, unless the poison is expelled by free vomiting. Professor Christison was severely affected by taking twelve grains of the kernel, and five grains have induced unpleasant symptoms. Dr. T. A. Fraser, of Edinbugh, and others have directed attention to the rapid contraction of the pupil which occurs when a small quantity of the extract is placed on the conjunctiva, or a little paper prepared by soaking it in an alcoholic tincture and then drying, is inserted within the lids; in about five minutes the contraction commences, and after thirty minutes the pupil is reduced to a mere point, continuing in this state for twelve or fourteen hours, and not passing off altogether for a few days; the colour of the iris is rendered perceptibly paler in some instances. This property can be employed to counteract the morbid adhesions of iritis, in wounds of the cornea, staphyloma, and some abnormal states of the eye, in which the pupil is inordinately dilated. Dr. Fraser attributes its effects to a depressing action on the spinal system, whence the radiating fibres of the iris are supplied with nerves,—the circular muscle of the iris continuing to contract, having cerebral filaments distributed to it. A neat preparation of gelatine impregnated with the principle of the bean is preferable to paper for placing within the eyelid, where it slowly dissolves; it is now extensively made in some of the London drug houses.

An INFUSION of the kernels is used in Calabar to destroy pediculi. A TINCTURE has been given internally, prepared by percolating ℥j. of the kernel, in fine powder, with rectified spirit, enough to yield f℥iij.; the DOSE is gtt. v., gradually increased until it lowers the force and frequency of the pulse; it is considered likely to be of service in hyperæsthetic conditions of the cord.

INDIGO ($C_{16}H_5NO_2$).—Is extracted from the leaves of different species of "*Indigofera*," cultivated in India, in which it exists in a colourless state during growth; it is obtained by fermenting the fresh leaves and stems, or by macerating the dried leaves, which is considered more advantageous; at a certain stage the liquid is drawn off, a small quantity of lime added, and on briskly agitating, the pigment separates as a deep-blue sediment, which is dried and cut into cakes. The indigo of commerce is a mixture of indigo red and brown, with pure indigotin, $C_{16}H_5NO_2$, which is separated from the other substances by subliming with care, or, better still, by adding to indigo, ℥iv.; grape sugar, ℥iv.; saturated solution of soda, f℥vi., in a flask, filling this with boiling alcohol, Ox., and closing for some hours; the clear fluid, drawn off and exposed to the air, deposits pure indigo.

Some years since indigo was used in treating nervous and spasmodic diseases, in doses of gr. v., thrice daily, rapidly increased until ℥j. was taken during the day; its effects were dubious, and it has now fallen into disuse.

SOLUTION OF SULPHATE OF INDIGO.—Employed to test free chlorine or nitric acid, either of which, when heated with it, destroy the colour of the sulph-indylic acid, HO, $C_{16}H_4NO$, 2SO_3.

Preparation.—Indigo, gr. v.; pure sulphuric acid, fʒj.; mix in a small test tube, and heat in a water bath for an hour; pour this into distilled water, f℥x.; agitate, and, when the undissolved portion subsides, decant the clear liquid into a stoppered bottle.

HÆMATOXYLON CAMPEACHIANUM.—Logwood.—Is obtained from Campeachy, and other parts of tropical America; it is now naturalized in Jamaica, but the wood grown there is less valued in commerce. The heart wood is imported in logs, with the bark and paler sap wood removed; it is hard, compact, of deep red colour, having a faint agreeable odour, and sweetish taste, tinging the saliva dark pink; large crystals of colouring material are sometimes discovered in the woody tissue. Chevreul separated brownish-yellow crystals, composed of $C_{40}H_{17}O_{15}$, termed hæmatoxylin, freely dissolving in boiling water or ether, and tasting like liquorice; by exposure to the air they absorb oxygen, forming hæmatin, and acquiring a deep purple hue.

Botany.—A tree, about forty feet high; stem crooked; spiny when in dry situations; leaves pinnate, two to four from the same point; leaflets two to four pairs, obovate; sepals united into a persistent tube, the lobes deciduous; petals larger than the sepals; stamens ten; legume small, flattened, pointed at each end; two-seeded.

Effects.—Logwood is prescribed in chronic diarrhœa and dysentery—particularly the diarrhœa of phthisis, usually combined with other astringents, as kino, catechu, opiates, or pernitrate of iron; and Dr. Percival gave it to check excessive sweating; its colouring matter, becoming absorbed, will tinge the urine, and has been mistaken for blood in it; but under a microscope blood globules are wanting, and when heated it affords no albumen.

DECOCTUM HÆMATOXYLI.—Decoction of Logwood.—An astringent, given in doses of fʒj. to f℥ij.; and strongly recommended in America for infantile diarrhœa.

Preparation.—Chips of logwood, ℥j.; distilled water, Oj.; boil for ten minutes, adding cinnamon, in powder, gr. lx., towards the end, and strain; the product should measure f℥xvj.

EXTRACTUM HÆMATOXYLI.—Extract of Logwood.—A deep ruby-red extract, liable to become so hard when kept, that pills made of it will pass unchanged through the bowels.

Dose.—Ten to thirty grains, best given in solution.

Preparation.—Logwood, in fine chips, lb. j.; boiling distilled water, one gallon; macerate for twenty-four hours; boil down to half; strain, and evaporate by a water bath to a proper consistence, stirring with a wooden spatula. Iron vessels should not be used.

TAMARINDUS INDICA.—**The Tamarind.**—Is a common tropical tree; its fruit is chiefly imported from the West Indies. The hard shell is removed, and the pulp preserved by being covered in alternate layers with sugar, or boiling syrup is poured over it; it consists of hard oval brown seeds, each enclosed in a membranous coat, numerous strong vegetable fibres, and a brownish pulp of sweet acidulous taste, which affords citric acid, some malic and tartaric acids, acid tartrate of potash, sugar, vegetable jelly, and gum.

Botany.—A tree, thirty feet high, of elegant foliage; leaves alternate, abruptly pinnate, with ten to fifteen pairs of leaflets, which are small and obtuse; flowers in racemes, yellow veined with red; calyx tubular, bilabiate above; petals three, unilateral; stamens two or three united, seven short and sterile; legume with a hard brittle rind, containing an acidulous pulp.

Effects.—Tamarinds are a gentle laxative, used in preparing confection of senna, and sometimes added to the infusion to cover its taste; the pulp is given as a refrigerant for slight febrile affections, or made into **tamarind whey**, by boiling about an ounce with new milk, Oj., and straining.

CASSIA FISTULA.—**Purging Cassia.**—This tree, termed from its long racemes of gaudy yellow flowers the laburnam of the tropics, is a native of most intertropical countries; its remarkable shaped legumes contain a dark pulp, of sweetish mucilaginous taste, and faint sickly odour; it is extracted by pouring water on the bruised legumes, straining through a sieve, and evaporating to a thick extract, those pods being preferred which are heavy, and do not rattle when shaken; its constituents are sixty-one per cent. of sugar, with gum and colouring matter.

Botany.—A showy tree, foliage like that of the ash, and flowering like laburnam; leaves twelve to eighteen inches long, with four to eight pair of leaflets; stipules minute; flowers in racemes, yellow and fragrant; legume cylindrical, one or two feet long, indehiscent, marked with three bands externally, and divided into cells by transverse partitions, each containing one seed, surrounded by a soft blackish pulp.

Effects.—Cassia pulp is a mild laxative, in full doses operating as a tolerably active cathartic; it is suited for children, and to relieve habitual constipation, though seldom prescribed unless in confection of senna; the urine is stated to acquire a deep brown colour from its use.

Dose.—A teaspoonful, to an ounce or two.

SENNA.—Is obtained from the leaves of different species of *Cassia;* the principal descriptions recognised in commerce are Bombay, Alexandrian, and Tinnevelly; of these the Bombay senna is the cheapest, and in ordinary demand, though not officinal.

TINNEVELLY SENNA.—Is derived from cultivated plants grown in the Tinnevelly district of Southern India, procured from seed which was brought from Arabia; it is usually of fine quality, being picked and dried with care, so that the leaflets are unbroken, of light green colour, often reaching two inches in length, and measuring nearly half an inch across; if allowed to become damp, they acquire a yellow hue, and are less esteemed.

ALEXANDRIAN SENNA.—Usually has the leaflets much broken, and can seldom be obtained free from adulteration; it is in part gathered in Nubia, from *Cassia lanceolata,* which affords two annual crops—in spring and autumn; the branches are cut, dried in the sun, the leaves stripped off, and forwarded to a central depôt at Boulac, near Cairo, where they are mixed with variable quantities of obovate senna—*C: obovata,* grown in other parts of Egypt and Syria, and with the leaves, flowers, and fruit of *Solenostemma arghel,* apparently added to senna as an intentional adulteration. For some years this leaf was seldom present, but of late is reappearing in the bales of Egyptian senna; it should always be removed by hand picking before using the senna in medicine.

COMMON OR INFERIOR EAST INDIAN SENNA.—Is in ordinary use; the leaflets are thin, pale-green or yellowish when old; an inch to an inch and a half in length; often mixed with stalks, pods, masses of dark brown leaflets, and other impurities; its quality is good, and its cheapness causes it to be much employed. This senna is brought from Africa and Arabia to Indian ports, and re-shipped in bales; its source is probably the same plant which yields Tinnevelly senna, growing on poor soils, and producing a smaller leaf.

Senna has a nauseous bitter taste, and peculiar tea-like odour; boiling water extracts about one-third the weight of the leaves; when its infusion is exposed to air, it deposits a dark insoluble precipitate, supposed to result from oxidation; with proof spirit it yields a brown tincture, and with rectified spirit an olive-green solution. In addition to a small quantity of volatile oil, chlorophylle, and other vegetable constituents, senna contains a bitter purgative principle, cathartin, the properties of which require further investigation.

BOTANY.—Shrubs; leaves simply or abruptly pinnate; petiole frequently glanduliferous; leaflets opposite; sepals five, unequal, scarcely united; petals unequal; stamens ten, free, unequal, the three upper with abortive anthers.

C: ELONGATA.—Annual, three feet high, leafy, and flowering luxuriantly when cultivated; leaves abruptly pinnate; leaflets five to eight pairs, ovate acute in the lower, and lanceolate in the upper part of the plant; racemes axillary and terminal; legumes pendulous, membranous, many-seeded (yields TINNEVELLY SENNA).

C: lanceolata.—About two feet high; leaflets five to seven pair; lanceolate acute, slightly downy, an inch long; legumes flat, elliptical (one of the sources of Alexandrian Senna).

C: obovata.—A perennial, one or two feet high; leaves equally pinnate; leaflets four to six pairs, obovate, obtuse, unequal at the base; stipules lanceolate, rather stiff and spreading; flowers yellow, in racemes; legumes broad, smooth, lunate, rounded at each end, with six to eight seeds (one of the constituents of Alexandrian Senna).

Adulterations.—Genuine senna is distinguished by the unequal character of the base of its leaves. Arghel is equal-sided, paler, thicker, and rougher than senna; its dried flowers are often present in small white corymbs, or separate; the fruit is more rare; it is an ovoid follicle, not unlike the size and shape of an orange seed: as arghel leaves are considered to cause griping, they ought to be picked out. On the Continent the leaves of *Coriaria myrtifolia*, a more important adulteration, are occasionally detected; the leaf is easily known, being equal-sided and trinerved; it is asserted to be astringent, and even poisonous.

Effects.—Senna operates as a mild and effectual purgative, useful in febrile affections, and for children or delicate persons; it is given with saline cathartics, and often agrees with an irritable stomach when other medicines are rejected; its liability to excite griping is the chief objection urged against it. Senna appears to operate on the entire intestinal canal, and will impart a purgative effect to the milk of nurses; when given to young children, it may be infused with coriander seeds, or a small quantity of tea, to disguise its taste, and flavoured with milk and sugar. Like all of the more active purgatives, it is unsuited for inflammatory affections of the bowels, in which constipation is more often a consequence of the disease than its cause, and its removal will depend on the success of our treatment in subduing the inflammation.

INFUSUM SENNÆ.—Infusion of Senna.—A useful vehicle for the neutral purgative salts. The common black draught consists of sulphate of magnesia, one-quarter of an ounce, dissolved in infusion of senna, f℥ij. When required for extemporaneous use, it is easily obtained by placing cold water on the leaves, heating to the boiling point, and infusing for ten minutes.

Dose.—f℥ij. to f℥iv.

Preparation.—Senna, ℥ss.; ginger, sliced, gr. xxx.; boiling distilled water, f℥x. Infuse in a covered vessel for one hour, and strain.

TINCTURA SENNÆ.—Tincture of Senna.—A cordial aperient, given in flatulence and gouty attacks, or prescribed with castor oil or infusion of senna in draughts.

Dose.—fʒij. to f℥j.

PREPARATION.—Senna, broken small, ʒijss.; raisins, freed from the seeds, ℥ij.; caraway, ℥ss.; coriander, ℥ss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

CONFECTIO SENNÆ.—CONFECTION OF SENNA.—Or lenitive electuary, is used in cases of habitual constipation, for hæmorroidal affections, and during pregnancy. It is liable to adulteration; rotten fruit and jalap are asserted to form the ordinary additions; they are difficult to detect; and it therefore is safer for the dispenser to prepare the confection himself.

DOSE.—A teaspoonful or two, taken night or morning.

PREPARATION.—Figs, ℥xij.; distilled water, f℥xxiv.; boil gently in a covered vessel for four hours; press, and strain the liquor; add more water to make up f℥xxiv., and boil this with prunes, ℥vj., for four hours; add tamarinds, ℥ix.; cassia pulp, ℥ix.; macerate for a short time, and press the pulp through a hair sieve; dissolve refined sugar, ℥xxx; extract of liquorice, three-quarters of an ounce, in the mixture, with gentle heat, and while warm add it gradually to senna, in fine powder, ℥vij.; coriander, in fine powder, f℥iij.: stir thoroughly until well mixed. The resulting confection should weigh ℥lx.

SYRUPUS SENNÆ.—SYRUP OF SENNA.—An agreeable purgative for children, in doses of fʒj. to fʒiv. An excellent syrup, in which the taste of senna is greatly covered, can be obtained by adding a concentrated infusion of the leaves to treacle, evaporated to almost a solid consistence.

PREPARATION.—Senna, broken small, ℥xvj.; distilled water, f℥lxx.; digest for twenty-four hours; press, and strain; digest the marc in f℥xxx. more water for six hours; press, and strain. Evaporate the mixed liquids to f℥x.; when cold, add rectified spirit, fʒij., previously mixed with oil of coriander, three minims; clarify by filtering, and wash what remains on the filter with distilled water, to make up f℥xvj.; then add refined sugar, ℥xxiv., and dissolve by gentle heat. The product should weigh lb. ij. ℥x., and have sp. gr. 1·310. (To measure Oj., f℥xijss.)

COPAIFERA MULTIJUGA.—COPAIBA—Is obtained from this tree and several allied species, and principally imported from the province of Para, in Brazil, other districts of tropical America also producing it. The oleo resin or balsam is got by making deep incisions in the stems of the growing trees at the end of the rainy season; and the operation is asserted to be repeated at invervals, old trees furnishing balsam two or three times during the year; it flows abundantly from the incisions, at first a clear, almost colourless fluid escapes, acquiring a thicker consistence and yellow tint afterwards; its sp. gr. varies from 0·95 to 0·98.

Copaiba is an oleo resin, distinguished from the substances properly termed balsams, by containing no benzoic acid; it resembles almond oil in colour and viscidity, has a peculiar, rather aromatic odour, and nauseous bitter taste; its physical properties are liable to considerable variation according to the age of the trees and the different species that produce it, and possibly influenced by the season of the year in which it exudes. It is insoluble in water, dissolves freely in alcohol, ether, and the fixed and volatile oils. When analyzed, it affords from 30 to 50 per cent. of volatile essential oil, isomeric with oil of turpentine; a resinous substance, capivic acid, $C_{40}H_{30}O_4$, resembling pinic acid, and a second viscous neutral resin; the preparation sold as resin of copaiba being a mixture of both these resins.

Botany.—The copaiba trees grow from twenty to fifty feet high, with abruptly pinnate leaves, and coriaceous ovate leaflets; flowers paniculate; sepals four parted, small; petals none; stamens ten, nearly equal; legume stalked, two-valved, with two ovules; one-seeded.

C: Multijuga.—Leaflets, six to ten pairs, ovate lanceolate, mucronate, with pellucid dots; petiole slightly hairy. This is the chief source of the copaiba from Para.

C: Langsdorfii and **C. Coriacea** are the probable sources of that brought from Rio and Bahia.

Adulterations.—When copaiba is dear, it is liable to be adulterated with different fixed oils, turpentine, and the distilled oil of Gurjun balsam, an addition pointed out by Dr. Redwood; this is the product of *Dipterocarpus turbinatus*, a native of Burmah, which closely resembles copaiba in properties, and apparently in medical effects. Guibourt states that it does not solidify with magnesia. A ready evidence of the goodness of copaiba is afforded by its odour; if this is not very manifest, although genuine, it possesses slight medical properties. A more satisfactory test is afforded by distilling a small portion; it should yield at least 40 per cent. of volatile oil.

Blondeau's test—depends on the property of genuine copaiba of dissolving one-fourth its weight of carbonate of magnesia, and continuing transparent.

Planché's test—is intended to detect castor oil; balsam thus adulterated, when mixed with liquor ammonia, sp. gr. 0·965, will become permanently turbid. Turpentine is recognised by its odour, when the copaiba is dropped on a heated iron.

Effects.—Copaiba exerts a stimulant action over the mucous membranes, and in large doses is liable to affect the bowels; when swallowed, it excites a sensation of warmth in the stomach and throat, with unpleasant eructations and nausea, and its continued use will impair the appetite. When balsam becomes absorbed into the circulation, it exhales in part through the lungs, the breath acquiring its distinctive odour, but the greater portion passes off by the kidneys, increasing their secretion, and altering the quality of the urine, which becomes deeper coloured, has a violet aroma, and when heated is frequently rendered turbid, a condition which has been mistaken for albumen; but the deposit does not subside when the test tube is permitted to rest. In a few individuals it will produce a cutaneous eruption closely resembling measles, and I have noticed occasionally large patches of urticaria.

Copaiba is specially employed in the treatment of gonorrhœa; it is prescribed in all stages of the disease; but should there be high local inflammation, chordee, or irritability of the bladder, it is better to suspend its use until they are previously subdued by suitable remedies. When decided improvement does not follow its administration within eight or ten days, the treatment had better be changed for cubebs, or injections may be tried; and where it succeeds, it ought to be persevered in for a week or two after all discharge has ceased, to guard against relapses. Some have advocated the exhibition of full doses as early as possible without previous precautionary measures, and assert that the sooner it is used, the speedier and more effectual will be the cure. In females it proves of trifling service, local remedies answering far better; both with males and females an emulsion of copaiba, made with mucilage and water, has been applied by injection for specific discharges, and is also stated to be a useful remedy in cases of non-contagious vaginal leucorrhœa.

Copaiba is occasionally prescribed for chronic bronchitis and the catarrhal affections of advanced life; it is used with advantage in cases of protracted diarrhœa and dysentery, and in catarrh of the bladder and irritation of that organ often proves of material benefit, when taken in small doses of five to eight drops, repeated every few hours; it has also been given to relieve painful hæmorrhoidal affections, and diseased conditions of the rectum.

Dose.—Twenty drops to fʒj., taken three or four times in the day, floating on some aromatic water, or made into emulsion with mucilage or yolk of egg; it can be formed into pills with its own weight of magnesia, after resting for several hours to solidify. Capsules of gelatine or of gluten are also sold, containing about ten drops of copaiba, or less; in some instances train oil has been found inside these capsules, instead of genuine copaiba. The alkaline solution of copaiba with potash, sold as Franks' Specific, is a well-known and effectual mode of using this remedy; a formula for preparing a similar solution is subjoined:—

Franks' Specific Solution.—Rub equal parts of copaiba and liquor potassæ together; when they form a clear mixture, dilute with water, eight parts, and add spirit of nitric ether, half a part. Mix, and decant off the clear fluid. Dose.—fʒj., diluted in water, thrice daily.

OLEUM COPAIBÆ.—Oil of Copaiba.—Got by distilling copaiba with water, which should afford from one-third to half its weight of oil; it is colourless or pale-yellow, having a strong odour and taste of the balsam; is soluble in ether or alcohol, and boils about 470°; its composition is similar to turpentine, with which it is isomeric; it is preferred to balsam for internal use, as it can be given in smaller quantities, and is free from the inert resinous principles.

Dose.—Ten to twenty drops, taken on sugar or in emulsion.

ACACIA.—Various species yielding Gum.—The gum-bearing Acacias are usually thorny trees, or shrubs, growing in sandy desert soils, or forming dense forests, in different parts of the African continent. The gum exudes spontaneously from the stem through fissures in the bark, springing from the cambium and medullary rays; it abounds in dry hot seasons, and, being derived from the sap of the trees, its excessive loss renders them unhealthy. In commerce several varieties of gum are recognised.

Turkey Gum.—Is officinal; it is collected in Cordofan, Nubia, and Upper Egypt; it consists of sharp angular fragments, and rounded tears, varying from the bulk of a pea to that of an almond in its shell; is translucent or opaque from numerous minute fissures; brittle, and readily dissolves in cold water; the colourless pieces are more valued than those with a yellow or reddish-yellow hue, and when separated bear a higher price; its sp. gr. varies from 1·31 to 1·48; it is the product of *Acacia vera*, *A. Arabica*, and probably other species.

Barbary Gum.—Is referred in part to *A. Gummifera;* it is a mixed gum, portions resembling gum arabic, and others gum senegal, being imperfectly soluble in water, and dark coloured; it is chiefly imported from Mogadore.

Senegal Gum.—Is obtained from immense forests north of the Senegal, its chief sources being *A. Vera* and *A. Senegal;* it consists of large oval or rounded masses, frequently hollow, having a central cavity; sometimes colourless, more often yellow or reddish; tough, difficult to powder, and less soluble in water than gum arabic. Gum is also brought in smaller quantities from India and the Cape.

Gum essentially consists of a peculiar principle, termed arabin, soluble in cold water, producing a viscid mucilage; it is precipitated by alcohol, and combines with subacetate of lead to form an opaque white jelly, which affords a delicate test of its presence; fresh mucilage reacts faintly acid; if exposed to air, it gradually sours, yielding acetic acid.

Botany.—Trees, with bipinnate leaves; flowers yellow or white, in heads or spikes; calyx four to five toothed; petals four to five, free or cohering; stamens ten to two hundred; legume continuous, dry, bivalved.

Adulterations.—Starch is detected in powdered gum, by iodine solution striking a blue colour. Dextrine, or British gum, mixed with potash and solution of sulphate of copper, and boiled, deposits suboxide of copper; no such effect is produced with genuine gum.

Effects.—Mucilage is popularly considered demulcent, and used to relieve the scalding in gonorrhœa, over which it can exert little influence; and added to expectorant mixtures, perhaps more from habit than for its positive value; it may prove of some slight benefit in irritation of the fauces, causing troublesome cough. In pharmacy it is employed for suspending oils or resins, as castor oil, copaiba, and turpentine, or insoluble powders, as musk and bismuth.

MUCILAGO ACACIÆ.—Mucilage of Gum Arabic.—Used to suspend oils and balsams in water, forming emulsions; they require about an equal bulk of mucilage, resins nearly double this quantity, and musk five times its weight.

Preparation.—Suspend gum arabic, in small pieces, ℥iv., in a muslin bag, under the surface of boiling water, f℥vj., in a deep vessel; after thirty-six hours squeeze out the fluid remaining in the bag, and mix.

ACACIA CATECHU.—Catechu Nigrum.—Is obtained from this source. The tree abounds in the jungles and low hills of several districts of India and Pegu, and is now common in Jamaica; its wood affords one of the numerous astringent substances that have been termed catechu. To obtain it, the heart wood is cut into chips, and boiled with water in earthen pots; the strained decoction evaporated to an extract, and poured into moulds, where it concretes. It is imported in large-sized masses from Pegu, and presents a dark brown shining appearance, disposed in layers, coated with a covering of leaves; its taste is strongly astringent, with some bitterness. Catechu consists essentially of mimotannic acid and catechin, mixed with a brown substance resulting from their oxidation. Mimotannic acid is soluble in cold water; it precipitates with gelatine, but differs from oak tannin in not precipitating tartar emetic, and renders persalts of iron greenish-grey. Catechin is insoluble in cold water, dissolves in three or four parts of boiling water, or in alcohol, and deposits in minute crystals on cooling; it has no action on gelatine.

Botany.—A tree, fifteen to twenty feet high; wood hard; duramen dark red, the alburnum white; stipules changing to thorns; leaves bipinnate, with ten to fifteen pairs of pinnæ, petiole often spiny underneath; flowers numerous, in spikes, white; petals united; stamens distinct, numerous; legumes thin, smooth, with four to six seeds.

Adulterations.—Its visible characters are the best test of its quality; siliceous and other insoluble substances are detected by being insoluble in water.

Effects.—A powerful astringent, constantly prescribed for diarrhœa, and used in gargles or lozenges for relaxation of the throat; singers, and those who speak much, are in the habit of employing it to relieve or prevent hoarseness; its liability to induce constipation is the principal objection to this practice. It has also been advised for passive hæmorrhages, but gallic acid is more to be relied on.

TINCTURA CATECHU.—Tincture of Catechu.—Is added to chalk and other astringent mixtures for diarrhœa, in doses of f℥ss. to f℥ij.; and painted over fissures of the nipple in nurses, for which it often proves an effectual remedy.

Preparation.—Catechu, in coarse powder, ℥ijss.; cinnamon, bruised, ℥j.; proof spirit, Oj.; prepared by percolation and maceration, like tincture of aconite; to yield Oj.

INFUSUM CATECHU.—Infusion of Catechu.—Used internally as an astringent, in doses of f℥ss. to f℥ij., frequently combined with opiates and port wine. It is also employed in gargles.

Preparation.—Catechu, in coarse powder, gr. 160; cinnamon, bruised, gr. xxx.; boiling distilled water, f℥x. Infuse in a covered vessel for half an hour, and strain.

PULVIS CATECHU COMPOSITUS.—Compound Powder of Catechu.—It is difficult to perceive the advantage of mixing so many astringents of similar properties.

Dose.—Ten to thirty grains.

Preparation.—Catechu, ℥iv.; kino, ℥ij.; rhatany, ℥ij.; cinnamon, ℥j.; nutmeg, ℥j.; powder separately. Mix, and pass the powder through a fine sieve; keep in a stoppered bottle.

Rosaceæ.—Herbs, trees, or shrubs; leaves usually compound and stipulate; flowers showy; calyx permanent, lined with a disk; petals five, equal; stamens definite or indefinite; ovaries solitary or several, distinct or united; styles obliquely inserted on the ovary; fruit variable; seeds exalbuminous; embryo straight, with flat cotyledons. The suborders are—

Amygdaleæ.—Trees, or shrubs, with deciduous calyx tube; fruit a drupe; stipules not united to the petiole. Examples—

Amygdalus communis,
Prunus domestica,
Prunus laurocerasus.

Roseæ.—Carpels not adhering to the calyx tube; fruit achenes or follicles; stipules united to petiole. Examples—

Brayera anthelmintica,
Rosa Gallica,
Rosa centifolia,
Rosa canina.

Pomeæ.—Carpels one to five, adhering more or less to the calyx tube and each other; fruit a pome; stipules not adhering to petiole.

No officinal species in this suborder.

AMYGDALUS COMMUNIS—The Almond Tree.—Is a native of Persia, and extensively cultivated in southern Europe. The best sweet or Jordan almonds are imported from Malaga; they are large, narrow, and have a clear cinnamon-brown cuticle; those from Valentia are smaller, and with a dusty-brown integument; for medical use, they are blanched by immersion in water until the seed coats swell sufficiently to be detached, leaving the embryo with its large cotyledons. They consist, in every 100 parts, of fifty-four of sweet oil of almonds; twenty-four of vegetable albumen or emulsin, soluble in cold water, and forming an emulsion with the oil; some uncrystallizable sugar, and gum.

Botany.—A small tree; leaves lanceolate, acutely serrate, folded flat when young; petiole glandular; flowers nearly sessile, appearing before the leaves; calyx campanulate; fruit a dry drupe, ovoid, woolly outside, when ripe bursting irregularly; within is the shell enclosing the almond.

PULVIS AMYGDALÆ COMPOSITUS.—Compound Powder of Almonds.—Used for preparing the mixture; it is preferred when recently made, as it is liable to alter.

Preparation.—Jordan almonds, ℥viij.; immerse in cold water until their skins are easily removed; when blanched, dry them thoroughly with a soft cloth, and rub them lightly in a mortar to a smooth consistence; mix gum arabic, in powder, ℥j.; refined sugar, ℥iv., and, adding them to the pulp, gradually rub the whole to a coarse powder; keep it in a lightly covered jar.

MISTURA AMYGDALÆ.—Almond Mixture.—Also termed almond milk, from its close resemblance to milk, consists of an emulsion of finely divided oil globules, with sugar and albuminous matter. It soon spoils when kept, and is coagulated by acids. It is used for exhibiting more active remedies, as nitre, solution of potash, or hydrocyanic acid; and as a cooling drink in febrile affections.

Preparation.—Compound almond powder, ʒijss.; distilled water, Oj.; gradually rub with a little of the water to a thin paste; then add the rest, and strain through muslin.

OLEUM AMYGDALÆ.—Almond Oil.—Is obtained by expressing sweet or bitter almonds, each hundred weight producing from forty-eight to fifty-two pints of the oil; the bitter almonds are chiefly used, being cheaper. The oil is a pale yellow bland inodorous liquid, sp. gr. 0.911 to 0.920, consisting of seventy-six parts of olein, with twenty-four of stearin; it dissolves in six volumes of boiling or twenty-five of cold alcohol; it is liable to be adulterated with cheaper oil, as poppy-seed oil. This fraud is detected by adding a few drops of nitric acid to it on a slab, which soon solidifies the impure oil,

Effects.—It is gently laxative in doses of f℥ss. to fʒij.; made into emulsion with mucilage and water, it is occasionally employed as a demulcent.

UNGUENTUM SIMPLEX.—Simple Ointment.—Used for dressing blisters and excoriated surfaces; or for mixing with more energetic local remedies.

Preparation.—White wax, ℥ij.; prepared lard, ℥iij.; almond oil, f℥iij.; melt on a water bath; remove, and stir until cold.

THE BITTER ALMOND.—This variety is not officinal. It is imported from Mogadore, and largely used for expressing almond oil. The residue, termed almond cake, in addition to emulsin or synaptase, contains amygdalin, which can be extracted by the action of hot alcohol, and on evaporating after fermenting the residue to decompose any sugar, is obtained in odourless crystalline tufts, composed of $C_{40}H_{27}NO_{22}$; it exists in distinct cells in the seed, and has the property of decomposing in the presence of emulsin and of water, yielding for every 100 parts about forty-one of the fragrant essential oil of almonds, and six of prussic acid; glucose, and formic acid are also produced. The reaction which ensues can be thus explained:—

$$\begin{array}{l} \text{Amygdalin, two atoms} \\ = 2\,C_{40}H_{27}NO_{22}, \;.\;. \end{array} \left\{ \begin{array}{llll} 4 & \text{equivalents of} & \text{volatile oil, . . .} & .\ 4\,C_{12}H_5O_2H. \\ 2 & \quad ,, & \text{hydrocyanic acid,} & .\ 2\,C_2NH. \\ 1 & \quad ,, & \text{glucose, ...} & .\ 1\,C_{12}H_{14}O_{14}. \\ 4 & \quad ,, & \text{formic acid, . .} & .\ 4\,HO, C_2HO_3. \\ 6 & \quad ,, & \text{water, ...} & .\ 6\,HO. \end{array} \right.$$

This decomposition has been proposed to obtain hydrocyanic acid for medical use. Thus, gr. xvij. of amygdalin, dissolved in almond emulsion, f℥j., yields gr. j., of hydrocyanic acid, equivalent to fifty minims of the pharmacopœial acid.

OIL OF BITTER ALMONDS ($C_{14}H_5O_2$, H).—Hydride of Benzoyle.—Is procured by mixing bitter almond cake after pressing out the fixed oils, with water, and when the amygdalin is decomposed, distilling the mixture; this is best accomplished by injecting steam, which obviates all risks of charring the vegetable matter; the volatile oil passes over, forming a milky solution with the water, and after resting for some time, separates in great part; the residue of the distilled fluid, which still holds a portion of volatile oil dissolved, is reserved for redistilling. Amygdalin yields for every 100 parts, forty-one of essential oil, and six of hydrocyanic acid; as sold in the shops the oil contains from six to fourteen per cent. of this acid, and is highly poisonous; it smells powerfully of almonds; dissolves in alcohol or ether, and with sulphuric acid forms a thick crimson liquid; it usually is yellow, but can be obtained colourless; its sp. gr. varies from 1·05 to 1·08, the lighter having most hydride of benzoyle, the heavier more camphor of the oil or benzoine; exposed to air it absorbs oxygen, and is converted into benzoic acid, which often crystallizes in bottles of the oil when long kept. Oil of bitter almonds is purified from hydrocyanic acid by distillation with water, chloride of iron, and lime; by this means it is got of sp. gr. 1·043; it boils at 356°, and burns with a smoky flame.

ADULTERATIONS.—Nitrobenzole ($C_{12}H_5NO_4$) is extensively used as a substitute, under the term ESSENCE OF MIRBANE; it is got by adding benzole in small quantities to warm fuming nitric acid so long as it dissolves, and on diluting the solution separates as a yellow oil, which is purified by washing with water, and then with a weak solution of carbonate of soda. Its specific gravity is 1·2; it solidifies at 37°, boils at 415°, and distils unchanged; if dissolved in ether, mixed with alcohol and hydrochloric acid, and a few fragments of zinc added, it is reduced to aniline, which is liberated by excess of potash; if the aniline is now dissolved in ether, and treated with chloride of lime solution, it develops a characteristic violet tint. Nitrobenzole is a dangerous poison, and requires to be used with caution.

EFFECTS.—Oil of bitter almonds almost invariably contains so much hydrocyanic acid that it is intensely poisonous; if freed from this acid, it appears to have no deleterious properties, and the purified oil ought always to be used for purposes of flavouring; when dissolved in seven parts of rectified spirit, it constitutes ESSENCE OF RATAFIA, OR PEACH FLAVOUR, a favourite perfume, much employed for confectionary. If taken internally in small dose, the oil is converted into hippuric acid, and passes off through the kidneys. When accidents result from its use, the same treatment is required as for hydrocyanic acid; and should it prove fatal, its persistent odour renders it easily recognisable; the prussic acid is detected by its usual reactions. This oil is not officinal.

PRUNUS DOMESTICA.—THE PLUM TREE.—The fruit of the cultivated plum, dried in the sun or in ovens, constitutes the prune or French plum; the table plum is obtained from the larger varieties, the medicinal prune from the black Damascus plum, *P: Juliana;* it is principally imported through Bordeaux. Prunes, like other dried fruit, are gentle laxatives; they are used to relieve habitual constipation, and for preparing the confection of senna.

BOTANY.—A small tree, with smooth branches, and elliptical leaves; flower buds of one or two flowers: petals white; drupe fleshy; nut smooth, acute on both sides. Many varieties are cultivated.

PRUNUS LAURO-CERASUS. — THE CHERRY LAUREL. — A native of Asia Minor, now cultivated in every shrubbery; its leaves are employed; they have little odour until bruised, when they emit a strong almond flavour; the production of which is caused by a reaction similar to that which forms bitter almond oil. Christison obtained from 1000 parts of young leaves and unexpanded buds gathered in May and June, 6·33 of essential oil; this sinks in July to 3·1, and in the following May to 0·6; the oil is oxidized by exposure to air, and deposits crystals of benzoic acid, which are often observed in laurel water when long kept; laurel leaves are used for preparing the distilled water.

Botany.—A smooth evergreen; leaves with short petioles, oblong acuminate, slightly serrate, shining, with two or four glands on the lower surface, and coriaceous; racemes axillary; petals white and spreading; fruit black, the size of a small cherry.

AQUA LAUROCERASI.—Laurel Water.—Is a solution of the essential oil in water, with variable quantities of hydrocyanic acid, seldom exceeding one quarter of a grain per cent. It is employed for flavouring mixtures, and as a sedative in spasmodic coughs, phthisis, pertussis, and other diseases for which hydrocyanic acid is useful.

Dose.—Twenty to thirty drops.

Preparation.—Fresh leaves of common laurel, lb. j.; chop and bruise them in a mortar; macerate with water, Oijss., for twenty-four hours; distil a pint of the liquid, using a chloride of zinc bath and a Liebig's condenser; shake the product, filter through paper, and preserve it in a stoppered bottle.

When laurel water is distilled, much of the oil comes over in the commencement of the process; the water is shaken to dissolve as much as possible of the oil, and the excess is removed by filtration.

BRAYERA ANTHELMINTICA.—The Cusso, or Kousso Tree.—Grows in Abyssinia; its flowers are imported as an anthelmintic, and their effects have been described by several travellers; Bruce published an excellent drawing of it; and Dr. Brayer, in 1823, again directed attention to its properties, which were observed by him at Constantinople; the plant has been named after him by Kunth. The flowers are gathered before the seeds ripen, and dried in the sun; they are tinged with purple, but after drying acquire a greenish-yellow colour, and many of them are found fully expanded on the panicles in which it is imported; the odour of cusso is peculiar, resembling a mixture of hops, senna, and tea; its taste is at first slight, afterwards acrid and unpleasant; when analyzed, it affords a bitter acrid resin, tannin, fatty matter, sugar, gum, and other vegetable constituents.

Botany.—A tree, about twenty feet high; branches round, downy, marked by annular cicatrices of the fallen leaves; leaves alternate, imparipinnate, sheathing at the base; leaflets serrated; flowers small, diœcious, in bunches, greenish coloured, becoming purple; the male has the carpels well developed; the female has a larger outer layer of calyx, no petals, and sterile stamens; ripe fruit unknown.

Adulterations.—Its high price, when first introduced, led to the admixture of pomegranate bark and jalap with its powder; sophistication is impossible if the flowers are purchased entire.

Effects.—This is a valuable remedy for expelling the ordinary tapeworm—*Tænia solium*, on which it appears to operate as a direct vermicide, but requires to be repeated to ensure a successful result, as the upper joints of the animal are liable to remain behind, being protected by the intestinal secretions; it is less relied on for the more rare *Tænia mediocannelata*, or for the bothriocephalus, for which the male fern oil is preferred. Bruce, in his description, denies its power of expelling the tapeworm, and asserts that it destroys the ascaris, for which we seldom give it. The exhibition of a full dose of cusso is rarely followed by any obvious symptoms; sometimes there is slight thirst, and purging which is so uncertain that it is better to precede and follow its employment with a brisk aperient; the nausea and vomiting that are occasionally complained of, are caused more by the bulk of the drug and its unpalatable taste than by its medical action.

Dose.—For the adult, a quarter to half an ounce is given in infusion; the patient should be placed on soft diet, and take some purgative before using it, to expose the parasite as fully as possible to its influence; both the fluid and the powder are swallowed, fasting, in two or three draughts, at short intervals; a little lemon juice renders the taste less unpleasant; some warm tea is advised, to promote its operation, and, if necessary, a dose of castor oil, given within three or four hours. It is always better to repeat its administration after a week or two, to expel any of the joints left behind.

INFUSUM CUSSO.—**Infusion of Kousso.**—The quantity directed is a small average dose for an adult.

Preparation.—Kousso, in coarse powder, a quarter ounce; boiling distilled water, f℥iv. Infuse in a covered vessel for fifteen minutes, and use without straining.

ROSA CANINA.—**The Wild or Dog Rose.**—The fruit, commonly termed the hip, consists of a fleshy calyx tube, enveloping numerous hard achenes, surrounded by fine hairs, which will irritate the skin similar to cowage; these enclosed parts are always removed. The fruit when ripe is scarlet and juicy; its pulp tastes sweet and slightly acid; it contains sugar, with citric and malic acids, and is considered best when mellowed by frost. It is used to make the conserve.

Botany.—A variable species, several of its varieties having distinct names; the stem has scattered hooked prickles, dilated at the base; leaves naked or slightly hairy, leaflets irregularly serrate; flowers red, sepals deciduous; fruit scarlet, ovate, smooth, and shining.

CONFECTIO ROSÆ CANINÆ.—Confection of Hips.—Is used as a vehicle for forming pills or electuaries; it has an agreeable acidulous taste.

Preparation.—Hips, carefully deprived of their seeds, lb. j., beat into a pulp in a stone mortar; add refined sugar, lb. ij.; and rub well together.

ROSA GALLICA.—The Red Rose.—A native of southern Europe, is extensively cultivated in English flower gardens; its flower buds are gathered when unexpanded, and about the size of a nutmeg; the calyx is twisted off; the pale claws of the petals removed; they are then dried rapidly in a stove, and sifted, to remove the stamens and accidental impurities. Roses lose their purple velvet colour when exposed to light and air, and require to be preserved in tin canisters; the fresh petals yield about one-tenth their weight of dried leaves; they have an agreeable roseate odour, which becomes developed during drying, and bitterish astringent taste, from the tannin which they contain.

Botany.—A small shrub; prickles numerous, equal, mixed with glandular hairs; leaflets stiff, rugose; flowers several together, with leafy bracts; petals widely spreading, obcordate, of fine purplish colour; fruit oval, coriaceous.

Effects.—Roses are slightly astringent; they are chiefly valued for their colouring properties.

CONFECTIO ROSÆ GALLICÆ.—Confection of Roses.—Is employed as a constituent of different pill masses; it has the advantage of keeping well, and not candying.

Preparation.—Fresh red rose petals, lb. j.; beat into a pulp in a stone mortar; add refined sugar, lb. iij., and rub well together.

INFUSUM ROSÆ ACIDUM.—Acid Infusion of Roses.—This infusion is used to impart a fine red colour to mixtures, and the sulphuric acid renders it refrigerant and slightly astringent; it is constantly prescribed as a vehicle for sulphate of magnesia, the bitter taste of which it assists to cover; sulphate of quinine is precipitated by it, forming an insoluble white tannate, that becomes redissolved if dilute nitric acid is employed instead of sulphuric. Infusion of roses is much used in gargles, given with alum, tincture of myrrh, or capsicum. It should be remembered that alkalies change its red colour to green, and that sulphate of iron renders it olive-brown; above all, it must not be directed with acetate of lead, with which the sulphuric acid would produce an inert sulphate of lead.

Dose.—f℥j. to f℥ij.; when required, double the amount of dilute sulphuric acid may be added to it.

Preparation.—Boiling distilled water, f℥x.; dilute sulphuric acid, f℥j. Mix, and infuse with red rose petals, one-quarter of an ounce, in a covered vessel, for half an hour, and strain.

SYRUPUS ROSÆ GALLICÆ.—Syrup of Red Roses.—A mild astringent, added to gargles or acid mixtures for its colour, and sometimes used mixed with alum or catechu for aphthæ and ulcerations of the throat.

Dose.—From fʒss. to f℥j. may be given in an eight-ounce mixture.

Preparation.—Dried rose petals, ℥ij.; boiling distilled water, Oj.; infuse for two hours; squeeze through calico, and filter. Dissolve refined sugar, ℥xxx., in the liquor, by means of heat. The product should weigh lb. ij. ℥xiv., and have sp. gr. 1·335. (To measure Oj., f℥xivss.)

ROSA CENTIFOLIA.—The Cabbage Rose.—This rose, originally a native of Persia, may be considered the source of all our fragrant smelling garden roses. The petals are used for making rose water and otto of rose; they should be gathered when fully expanded, and used in a fresh state, or pickled with salt, which effectually preserves their odour; if dried, the fragrance is impaired.

Botany.—Many varieties are cultivated; it forms a bush with erect shoots, thickly covered with straight prickles, scarcely dilated at the base; leaflets glandular at the margin; flowers several together, drooping; sepals spreading during flowering; calyces and peduncle fragrant.

AQUA ROSÆ.—Rose Water.—This is best distilled in large quantities; when well made it has a fine aroma, and is much superior to any simple solution of the essential oil in water; it must be preserved in moderate sized bottles in a cool place.

Uses.—Chiefly for preparing lotions and collyria, to which it imparts an agreeable odour.

Preparation.—The fresh petals of the hundred-leaved rose, lb. x.; water, two gallons. Distil one gallon.

OIL OR OTTO OF ROSE.—Is imported from Persia and Northern India, where it is got by distilling the flowers, the oil collecting on the surface of the water as it cools; the quantity obtained is trifling: a hundred pounds of the petals will yield about fʒiij. The otto is colourless, or pale yellow; it consists of a liquid odorous portion, soluble in alcohol, which contains oxygen, and a solid stearopten composed of carbon and hydrogen, resembling spermaceti in appearance; these are separated by freezing, and pressing in blotting paper, which removes the liquid part. From its high commercial value this oil is liable to be adulterated with oil of rose geranium, or grass oil got from the *Andropogon nardus*, a native of the Moluccas. Otto, though not officinal, is frequently used as a perfume in medical preparations.

MYRTACEÆ.—Trees, or shrubs; leaves usually opposite, with transparent dots, and often with an intermarginal vein; calyx four or five cleft, adherent by its tube to the ovary; petals arising from the throat of calyx, equal in number to its divisions; stamens many; anthers ovate, small; ovary many-celled; fruit dry or fleshy; seeds numerous, without albumen.

MELALEUCA MINOR.—THE CAJEPUT TREE.—Grows in the Molucca Islands. The fragrant essential oil, OLEUM CAJEPUTI, is procured from its leaves by distillation; they are gathered in September, macerated for twenty-four hours in water, and on applying heat the oil passes over, and is collected, floating on the surface of the fluid in the receiver; it is limpid, of light bluish-green colour, and volatile penetrating odour, resembling a mixture of camphor and cardamoms, and consisting of $C_{10}H_{9}O$; its taste is aromatic, leaving a sensation of coolness on the mouth similar to that caused by peppermint; the sp. gr. varies from 0·914 to 0·927; it boils at 343°. The colouring matter observed in this and other blue oils is considered to be a peculiar constituent termed azulin, which can be separated, leaving the residue free from colour.

BOTANY.—A small crooked tree, with thick soft bark; branches scattered; leaves lanceolate, three to five nerved, aromatic if bruised; spikes terminal, with a scaly bud at the apex, which afterwards becomes a leafy branch; bracts solitary, three-flowered; corolla white; stamens thirty or forty, in five bundles; anthers with a yellow gland at the apex; ovary ovate, three-celled.

ADULTERATIONS.—A mixture of oil of rosemary or cardamoms with camphor, coloured by copper, or resin of milfoil, has occasionally been substituted for it; the ferrocyanide of potassium will detect the presence of copper, by giving a brown precipitate.

EFFECTS.—Oil of cajeput is a powerful diffusible stimulant, highly valued in the East; Pereira considered its properties intermediate between camphor and valerian, and states that, when used in large doses, it is not liable to disorder the mind as these medicines do. It is prescribed in attacks of flatulent colic, nervous affections, and low fevers, in doses of two to ten drops, rubbed with sugar, or in emulsion. Added to liniments, it is used as a rubefacient, and applied to gouty or rheumatic pains, and for local paralysis.

SPIRITUS CAJEPUTI.—Spirit of Cajeput.—Given in doses of from five to thirty drops, properly diluted.

Preparation.—Cajeput oil, f℥j.; rectified spirit, f℥ix. Dissolve.

CARYOPHILLUS AROMATICUS.—The Clove Tree.—A native of the Moluccas, is now extensively cultivated in the East and West Indies. Cloves are the unexpanded flower buds, consisting of the globular corolla, seated on a long tubular calyx, having four short teeth; they are picked, or beaten from the tree with long rods, and quickly dried in the shade; when of good quality they are dark brown, large, heavy, and yield oil on pressure; they have a strong aromatic odour, and hot acrid taste.

Botany.—An evergreen, with hard wood, and smooth bark; leaves opposite, ovate lanceolate, coriaceous, dotted with glands; panicles short; calyx with a cylindrical tube, limb four parted; petals four, globular when in bud; stamens in four bundles; ovary two-celled, with many ovules; fruit a large berry with a single seed, the other cell and ovules having atrophied.

Adulteration.—Cloves from which the oil has been distilled are sometimes fraudulently mixed with good cloves; they are recognised by their lightness, and do not afford oil when bruised.

Effects.—Cloves are stimulant and aromatic; they are chiefly valued for covering the taste of other substances.

OLEUM CARYOPHILLI.—Oil of Cloves.—Is obtained by macerating cloves in water, and distilling them. The oil, which is heavier than water, subsides to the bottom of the receiver, and is separated; good cloves yield seventeen to twenty-two per cent. of colourless oil; it gradually becomes yellow or reddish-brown; its taste is fiery and acrid, and its odour like the clove, but less agreeable; it consists essentially of a hydrocarbon, sp. gr. 0·918, holding in solution a heavy acid body, eugenic acid, ($C_{20}H_{12}O_4$?) sp. gr. 1·08. A small quantity of caryophillin or clove camphor, produced by oxidation of the hydrocarbon, is also present. Oil of cloves is soluble in alcohol, ether, and strong acetic acid; according to Zeller, it becomes entirely solid and crystalline with alcoholic solution of potash, losing its odour; this reaction is proposed as a test of its purity. It is used in purgative pill masses to prevent griping, and is introduced into hollow teeth on cotton to relieve toothache. An essence of cloves, made by diluting the oil in seven parts of rectified spirit, is employed by confectioners for flavouring.

INFUSUM CARYOPHILLI.—Infusion of Cloves.—A mild aromatic, chiefly employed as a vehicle for other remedies.

Dose.—f℥ss. to f℥ij.

Preparation.—Bruised cloves, one-quarter of an ounce; boiling distilled water, f℥x. Infuse in a covered vessel for half an hour, and strain.

EUGENIA PIMENTA.—The Allspice Tree.—Is cultivated in the West Indies in avenues; its fruit is gathered when full grown, but green, and dried in the sun; the berries are brown, rough, about the size of a peppercorn, crowned by the persistent segments of the calyx, and consist of a brittle pericarp and two dark coloured seeds within; their fragrant odour is compared to a mixture of spices; it depends on a volatile oil, of which the husk affords about double the quantity in the seeds. Pimento is more used as a spice than for medicine; it is aromatic and stimulant.

Botany.—An evergreen tree, thirty feet high; leaves oblong, with pellucid dots, and smooth; flowers in panicles; calyx and corolla each four cleft; petals greenish-white; berry smooth, succulent, of dark purple colour, one, rarely two-celled, two-seeded; cotyledons consolidated.

OLEUM PIMENTÆ.—Oil of Pimento.—Prepared by distilling bruised allspice with water; it is colourless, or yellow, becoming darker through age; sp. gr. 1·020; having a strong aromatic odour of the fruit; it consists of a light hydrocarbon, and heavy acid oil similar to oil of cloves; the light oil, which is more volatile, can be separated by heat. Its effects are similar to other essential oils.

AQUA PIMENTÆ.—Pimento Water.—Stimulant and carminative; chiefly useful as an aromatic vehicle.

Dose.—f℥ss. to f℥ij.

Preparation.—Bruised pimento, ℥xiv.; water, two gallons; distil one gallon.

EUCALYPTUS RESINIFERA.—The Botany Bay kino exudes in great quantity from this and other species of Australian gum tree; its properties closely resemble those of ordinary kino; it is stated to be liable to disorder the stomach, and cause nausea. (See *Pterocarpus marsupium.*) It is not officinal.

Granateæ.—This tribe is often included in the Myrtaceæ; it is distinguished by its leaves not being dotted, by the want of a marginate vein, the peculiar fruit, the seed involved in pulp, and its cotyledons convoluted.

PUNICA GRANATUM.—The Pomegranate Tree.—Grows wild in Southern Europe and Asia, and is cultivated in most warm countries; the bark of the root is officinal; it is directed in a recent state, which would be difficult to obtain; and also dried, imported chiefly from Germany; it is sold in curved strips of greyish colour, yellow inside, brittle, astringent, but not bitter; its analysis shows the presence of tannin, fatty matter, a sugar resembling mannite, and a peculiar acrid oleo-resin, termed by Righini punicin, on which its vermifuge properties possibly depend. The rind of the fruit is astringent; it occurs in arched irregular pieces, reddish-brown outside, paler yellow within, odourless, brittle, slightly bitter, and containing about eighteen per cent. of tannin. It may be employed, similarly to other vegetable astringents, for checking diarrhœa and mucous discharges; in gargles for relaxed sore throat; and vaginal injections in leucorrhœa.

Botany.—A small tree; leaves lanceolate, smooth, on short stalks; flowers commonly solitary; calyx thick; petals crumpled, scarlet; stamens many; fruit the size of an orange, with a leathery rind, crowned by the calyx, having several cells, divided by a transverse dissepiment into three lower, and five to nine upper cells, each with many seeds.

Adulterations.—The barks of box and of barberry are asserted to be occasionally substituted; they are strongly bitter, not astringent.

Effects.—The root bark of pomegranate is considered a valuable remedy in Indian practice for tapeworm, administered in powder or decoction, which is preferred; if possible, the fresh bark should be used, and it is advisable to give an aperient previously, and confine the patient for some time before to soft or liquid food.

DECOCTUM GRANATI RADICIS.—Decoction of Pomegranate Root.—A wine glassful of this decoction is given every half hour in cases of tapeworm, until the animal is expelled; it usually kills the worm, but is liable to nauseate and purge. It ought to be repeated, at intervals of a few days, until no more joints are discharged.

Preparation.—The fresh or dry pomegranate root, sliced, ℥ij.; distilled water, Oij. Boil down to Oj., and strain.

Cucurbitaceæ.—Succulent climbing plants, with extra-axillary tendrils; leaves scabrous, palmately veined; flowers unisexual; calyx five-toothed; petals four to five, reticulated; stamens generally five, distinct or in three parcels, with sinuous anthers; ovary inferior, one-celled, with three parietal placentas; fruit a pepo; seeds flat, exalbuminous.

CITRULLUS COLOCYNTHIS.—Colocynth.—This plant grows wild in Asia and Africa, and is cultivated for medical use in Spain; the fruit, or pepo, is collected when ripe, and dried in the sun, or by the aid of stoves, after removing the hard rind; the pepos resemble oranges in size, those from Spain being the smallest; they are light, spongy, and so tough that they are difficult to powder; three-fourths of their weight consist of seeds; their odour is feeble, the taste nauseous, and intensely bitter. By percolation with alcohol, and subsequent decolorizing with charcoal, and evaporating, they yield a translucent yellow bitter principle, termed colocynthine, soluble in alcohol or water, and operating as an active cathartic, in doses of a grain and a half. Meissner states that the pulp contains fourteen per cent. of this substance, with resin, gum, and woody fibre. A small quantity of unpeeled colocynth, covered with its smooth yellow rind, is imported from Mogadore, chiefly for druggists' show-bottles. Thunberg asserts that at the Cape colocynth is used as a pickle; and a medical gentleman from the Mauritius informed me that the fruit when young is employed there as a vegetable, and only acquires its disagreeable taste by becoming older.

Botany.—An annual, with creeping rough stems; leaves many lobed, hairy beneath; petioles as long as the leaf, tendrils short; flowers single, axillary, yellow, with greenish veins; fruit globose, the size of an orange, with a thick hard rind and very bitter pulp.

Effects.—Colocynth is a powerful drastic purgative, which is seldom prescribed unless in combination with other remedies of the same class; it is considered to operate specially on the large intestine, increasing the vermicular action and secretion of the colon; excessive doses, as 90 grains of the powder, have proved fatal, producing violent vomiting, purging, and other symptoms of gastro-intestinal irritation; it resembles gamboge in its effects, but is less active. Colocynth is employed, usually in pill or extract, for all affections requiring purgation, as habitual costiveness, cerebral diseases, severe headach, and amenorrhœa, and is one of the ordinary constituents of purgative pill masses; amongst the lower orders it is a popular remedy for dropsies, used in decoction in porter, combined with jalap and gamboge. Its dose ranges from three to ten grains.

EXTRACTUM COLOCYNTHIDIS COMPOSITUM.—Compound Extract of Colocynth.—This forms a safe and energetic purgative, much employed for habitual constipation, and as an occasional aperient; in cases of suspected intestinal obstruction and incarcerated hernias, it often succeeds in producing free evacuations, and relieving the patient, when liquid purgatives would be rejected; and is sometimes administered in enema, dissolved in warm water. The temptation to adulterate this extract leads to the use of inferior scammony, or aloes; and even starch and gamboge have been detected in it.

DOSE.—Gr. v. to x., often prescribed with mercurials.

PREPARATION.—Colocynth, freed from seeds, ℥vj.; proof spirit, one gallon; macerate for four days; press out the tincture, and add to it extract of Socotrine aloes, ℥xij.; hard soap, in powder, ℥iij., and scammony, or resin of scammony, in powder, ℥iv. Distil off the spirit, and evaporate the residue in a water bath to a pilular consistence, adding cardamoms, freed from their capsules, in fine powder, ℥j., towards the end of the process.

The pulp yields forty-five to sixty-five per cent. of extract. The indiscriminate use of ordinary scammony, or of the resin, will cause this preparation to vary in strength more than appears necessary.

PILULA COLOCYNTHIDIS COMPOSITA. — COMPOUND COLOCYNTH PILL.—Resembles the last preparation in its properties and dose; it is liable to serious adulterations, which render it uncertain in its effects. Cape aloes can be detected by their odour; and should the pill mass effervesce with weak acids, inferior scammony has probably been used.

DOSE.—From five to ten grains; repeated, if required.

PREPARATION.—Colocynth, ℥j.; Barbadoes aloes, ℥ij.; scammony, ʒij.; sulphate of potash, one-quarter ounce, all in powder. Mix; add oil of cloves, fʒij., and beat into a mass with distilled water.

PILULA COLOCYNTHIDIS ET HYOSCYAMI.—PILL OF COLOCYNTH AND HYOSCYAMUS.—Henbane is frequently added to purgative pills, being considered to lessen their griping effects.

DOSE.—Five to ten grains, repeated every four hours until it operates.

PREPARATION.—Add to the constituents of the colocynth pill, extract of hyoscyamus, ℥iij., and mix thoroughly.

ECBALIUM OFFICINARUM.—THE ELATERIUM PLANT.—Or squirting cucumber, is a native of the south of Europe, and cultivated in some of the English medical gardens. It is essentially an annual, surviving for three or four years if the roots are covered up in winter. The seeds are sown in spring, and the plants placed out about June; the fruits are gathered early in September; they are remarkable for bursting when ripe, and expelling the seeds, with a portion of their acrid juice, to a considerable distance on the slightest touch; painful irritation of the eyes is liable to be induced by this fluid coming in contact with the conjunctiva. **Elaterium** is a sediment obtained from the expressed juice of the fruit; it exists in the green mucilaginous fluid surrounding the seeds, and is deposited from it by exposure to the air. Forty of the recent fruits yield about half an ounce of good elaterium; it consists of light, friable, slightly incurved cakes, marked on one side by the muslin on which it has been dried; when fresh, it has a characteristic aroma, and pale green colour, becoming yellowish by keeping. Inferior descriptions are dark brown, and hard; and the elaterium brought from Malta often contains starch and chalk as adulterations. The active principle of elaterium, termed elaterine, is bitter and crystalline; when of average good quality, it ought to afford from twenty to thirty per cent. of this constituent.

Purity.—When free from chalk, it does not effervesce with acids; rectified spirit dissolves half its weight out of the elaterium; and the solution, concentrated, and added to warm solution of potash, gives on cooling not less than twenty per cent. of colourless crystals of elaterine.

Botany.—An annual trailing plant, with thick branching stem; leaves rugose, greyish, on long stalks; flowers axillary; males in racemes; females with three sterile filaments, ovary three-celled; fruit oval, an inch and a half long, green, with soft prickles; when ripe it bursts from the stalk, and, contracting, expels its brown seeds and a slimy fluid through the aperture.

Preparation.—Take the fruit, very nearly ripe, lb. j.; cut it lengthwise, and lightly press out the juice; strain through a hair sieve, and set it aside to deposit; carefully pour off the supernatant fluid; pour the sediment on a linen filter, and dry it on porous bricks with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be similarly dried.

Effects.—Elaterium is a powerful hydragogue cathartic, producing large watery evacuations, and also acting on the kidneys; a single full dose, given in dropsies, will sometimes discharge several pints of fluid; it therefore requires to be used with caution for debilitated patients, and is liable to excite feverish symptoms, quick pulse, thirst, griping, and vomiting. The principal forms of dropsy for which it has been administered are ascites, depending on hepatic disease, and hydrothorax; from its liability to induce hypercatharsis, it is safer to employ small repeated quantities until the desired effect is obtained.

Dose.—The one-sixteenth to the one-fourth of a grain, given in pill or solution, dissolved by spirit of wine or sweet spirit of nitre, and repeated every four hours, or so, until it operates; it is often prescribed with bitters. Excessive doses, of two to three grains, have been described; they could only be given with safety by employing adulterated elaterium.

ELATERINE is sometimes used in doses of one-twentieth to one-eighth of a grain, mixed with acid tartrate of potash, or in solution.

UMBELLIFERÆ.—Herbs; stems hollow and striate; leaves alternate, compound, and sheathing; flowers in compound umbels, with involucres, and often involucels; calyx obsolete, or five-toothed; petals five, with cleft or inflexed points; stamens five, epigynous; fruit a cremocarp, composed of two mericarps, separating from a forked central column, marked by longitudinal ridges; seed solitary; embryo minute, in horny albumen.

CARUM CARUI.—CARAWAY.—This plant is cultivated in England and Germany. The fruit, commonly termed caraway seed, is a well-known spice; its agreeable taste and odour are caused by a volatile oil, of which it contains five per cent.

BOTANY.—A biennial, about two feet high; leaves bipinnate, leaflets much cleft; umbels without involucre, or with one or two small bracts, consisting of eight or ten rays; carpels with elongated linear vittæ.

OLEUM CARUI.—OIL OF CARAWAY.—Obtained by distilling the fruit with water; it is limpid, colourless when fresh, becoming yellow if kept; sp. gr. 0·938; it consists of a hydrocarbon, carvene, $C_{10}H_8$, mixed with an oxidized oil, carvol.

DOSE.—One to ten drops, given on sugar, or in emulsion, to correct the griping effects of purgatives, or for a carminative in the flatulent colic of children, in doses of one to two drops.

AQUA CARUI.—CARAWAY WATER.—Used in doses of f℥ss. to f℥j., as a vehicle.

PREPARATION.—Caraway, bruised, ℥xx.; water, two gallons. Distil one gallon.

PIMPINELLA ANISUM.—ANISE.—Is cultivated in the South of Europe; the fruit, or aniseed, is small, ovoid, composed of two greyish-green carpels, having five thin primary ridges; its odour is aromatic, and depends on volatile oil, of which it contains three per cent. It is used for flavouring, and, being warm and stimulating, is prescribed in the colic and diarrhœa of infants. The fruit of hemlock may be mistaken for it; they have a disagreeable smell, and are waved or crenated on the ridges of the carpels.

BOTANY.—Annual; stem smooth, one foot high; radical leaves heart-shaped; stem leaves biternate; segments linear; umbels on long stalks; no involucre; flowers small, white; calyx obsolete.

OLEUM ANISI.—Oil of Anise.—Got by distilling the fruit with water; it is colourless, or pale yellow, sp. gr. 0·98; consisting of a hydrocarbon and an oxidized oil, which solidifies at 50°, and does not liquefy again until the temperature rises to 62°. A large quantity of oil of star anise, *Illicium anisatum*, is imported from China; this, having less of the oxidized oil, continues liquid at 35°; both oils are officinal, and possess similar medical properties.

Dose.—Two to six drops, rubbed with sugar or magnesia, or given in emulsion.

FŒNICULUM DULCE.—Fennel.—The fruit, imported from Malta, is used; it is about three lines long and one broad, slightly curved, beaked, having eight pale brown longitudinal ribs, the two lateral being double; its taste and odour are aromatic. The plant differs from common fennel, being an annual, and of smaller size. Its effects are similar to those of anise or caraway.

Botany.—Stem slightly compressed at base; radical leaves somewhat distichous; umbels of six to eight rays; flowers yellow.

AQUA FŒNICULI.—Fennel Water.—Used in the colic of infants, and as a vehicle.

Dose.—f℥ss. to f℥j.; for children, fʒj. to fʒij.

Preparation.—The bruised fruit, ℥xx.; water, two gallons. Distil one gallon.

ANETHUM GRAVEOLENS.—Dill.—This plant is a native of Southern Europe, whence its fruit, commonly termed dill seeds, are imported; it is also cultivated for medical use in England. The fruits are oval, flat, of brownish colour, about a line and a half in length, with a thin membranous border; they have a strong aromatic odour, resembling caraway, and warm pungent taste.

Botany.—An annual, one or two feet high; stem striated; leaves tripinnate, segments capillary, leaf stalks sheathing; no involucre or involucel; flowers yellow; fruit oval, compressed, with a pale membranous margin; ridges filiform, the three dorsal acute.

OLEUM ANETHI.—Oil of Dill.—Is obtained by distilling the fruit with water; it is pale yellow, with a pungent aromatic odour, and acrid sweetish taste; sp. gr. 0·881; it dissolves readily in spirit or ether; its effects resemble those of the other essential oils; it is chiefly used as a carminative for infants.

Dose.—One to three drops, in emulsion, or rubbed with sugar, and added to water, to prepare an extemporaneous dill water.

AQUA ANETHI.—Dill Water.—Employed as a vehicle.

Dose.—f℥ss. to f℥j.

Preparation.—The bruised fruit, ℥xx.; water, two gallons. Distil one gallon.

CORIANDRUM SATIVUM.—The Coriander.—Is sometimes found wild in England, and is cultivated in Essex for use; its odour depends on a fragrant volatile oil; its effects are similar to the other aromatic umbelliferous fruits; it is employed by confectioners and distillers, and added to the electuary of senna as a flavouring ingredient.

Botany.—Stems annual, one or two feet high, round and smooth; leaves bipinnate, cut; petals white, with a pink tinge; fruit globose; carpels with obsolete primary ridges, and four prominent secondary ones, keeled.

OLEUM CORIANDRI.—Oil of Coriander.—A yellowish volatile oil, smelling strongly of the fruit, obtained in England by distilling with water; its effects resemble those of anise; it is used as a constituent of syrup of senna.

NARTHEX ASSAFŒTIDA.—Assafœtida.—This plant, a native of Affghanistan and the Punjaub, is the source of genuine assafœtida; possibly some allied species yield a similar exudation. It is obtained from the roots when the plants are at least four years old; the root leaves are removed early in spring, and in about a month after the top of the root is sliced off; the juice which exudes is permitted to concrete, and collected every three or four days, a fresh slice of root being removed each time, until it becomes completely exhausted; it is stated that in the course of six weeks the assafœtida can be collected ten or twelve times; it is finally dried in the sun, until fit for exportation, and packed in casks, which are imported through Bombay to Europe.

Assafœtida occurs in irregular masses, in which agglutinated tears are often perceptible; externally they are yellowish or pinkish-brown; when freshly broken, the colour is milk-white, or pearly, with a waxy lustre; by exposure to light it soon acquires a pink tint, deepening to yellow; it is inflammable, has a strong persistent garlic odour, which is considered extremely disagreeable by most persons, and an acrid bitter taste; but Asiatics are partial to it, using it with pleasure. Besides ordinary assafœtida, a variety is occasionally met in distinct tears, and another in lumps, containing a large quantity of gypsum; both are rare in English commerce. Its analysis affords twenty-six per cent. of gum, forty-seven of resin, 4·6 of volatile oil, with saline matter, lignine, and impurities. The oil, on which its odour depends, is closely allied to oil of garlic;

it is colourless, or slightly yellow, very volatile and pungent, spontaneously evolves sulphuretted hydrogen, and dissolves in alcohol; it contains sulphide of allyl, C_6H_5S.

The resin of assafœtida, by the action of light, acquires a violet hue, and is the source of its peculiar change in colour.

Botany.—Root perennial, six to twelve inches thick, abounding in milky juice, with a dark bark; stems six to eight feet high; leaves numerous, eighteen inches long, resembling the pæony; flower stalk solid, with a large head of compound umbels; no involucre; flowers small, many barren; fruit flattened, with a dilated border, five to six lines long, two or three broad; dorsal ridges filiform, the lateral obsolete, with interrupted vittæ.

Effects.—Assafœtida is a powerful antispasmodic; in full doses, mildly stimulant and laxative; it causes sensations of heat in the stomach and eructations, and, becoming absorbed, can be detected in the secretions and the breath by its odour. It is prescribed for spasmodic and convulsive diseases, unattended with organic lesions of the nervous centres, and appears to operate through the spinal system; in hysteria its preparations are highly esteemed; it may be given during the intervals of the attacks, when it acts more effectively in mixture than in the form of pill, but its disagreeable odour limits its employment; camphor and ammonia are often combined with it, and, if necessary, aloetic purgatives; during hysterical paroxysms, it proves a rapid and effectual remedy for relieving the tympanitic condition of the bowels, administered in enema; it is also of use in all forms of flatulent colic, such as occurs in the aged, in nervous or dyspeptic individuals, and in young infants; when there is constipation present, it may be added to ordinary purgative enemas. Assafœtida was supposed to have some direct effect as an emmenagogue, but this does not appear to be well founded; like many other gum resins, it is of service in long-continued chronic catarrh, accompanied with excessive expectoration and difficulty of breathing, in the secondary stages of subacute bronchitis, and towards the termination of hooping cough, controlling the increased secretion of the mucous bronchial membrane, and promoting its free discharge. For spasmodic asthma some practitioners assert that they have found it of little use; others are disposed to speak more favourably of its action; it has proved of occasional benefit in attacks of chorea, and epileptiform fits, although at present seldom relied on in treating these nervous affections.

Dose.—Ten grains of good assafœtida is considered a medium quantity; to produce its full effects, from twenty to forty grains require to be given, in pills or emulsion.

TINCTURA ASSAFŒTIDÆ.—**Tincture of Assafœtida.**—Employed in the treatment of hysteria, and for flatulence, in doses of f℥ss. to f℥ij.; when added to water, it becomes milky, from the resin being precipitated.

Preparation.—Macerate assafœtida, in small fragments, ℥ijss., in rectified spirit, Oj., for seven days. Strain, filter, and add rectified spirit, to make up Oj.

ENEMA ASSAFŒTIDÆ.—Enema of Assafœtida.—A useful stimulating and carminative injection for hysteria, flatulent colic, and the convulsive affections of children.

Preparation.—Tincture of assafœtida, fʒvj.; mucilage of starch, f℥vj. Mix.

PILULA ASSAFŒTIDÆ COMPOSITA.—Compound Assafœtida Pill.—Used as a convenient form for administering assafœtida; in preparing it prolonged heat should be avoided.

Dose.—Five to twenty grains.

Preparation.—Assafœtida, galbanum, myrrh, of each, ℥ij.; treacle, by weight, ℥j. Heat together in a capsule, with a steam or water bath, and stir the mass until uniformly mixed.

PILULA ALOES ET ASSAFŒTIDÆ.—Pill of Aloes and Assafœtida.—Has the advantage of being purgative; chiefly given in hysteria.

Dose.—Five to fifteen grains.

Preparation.—Mix thoroughly powdered Socotrine aloes, assafœtida, hard soap, and confection of roses, of each ℥j.

GALBANUM.—Is imported through Bombay, to which it is probably brought from Persia, as plants, species of *Ferula*, are found on the Demawend Mountains, yielding a gum resin similar to commercial galbanum. It consists of irregular tears, about the size of a pea, or agglutinated masses, of brownish-yellow colour, often translucent in parts when freshly broken, mixed with fragments of stems and seeds, having a strong disagreeable odour, and acrid bitter taste; it consists of resin and gummy matter, with odorous volatile oil; triturated with water, it forms an imperfect milky solution. Its effects resemble those of assafœtida, to which it is inferior as an antispasmodic, but is more employed externally in plasters, being less offensive; it acts as a mild stimulant, applied over chronic tumors, scrofulous joints, and indolent swellings of the glands, to promote their absorption. This substance is gradually falling into disuse.

Dose.—Ten to twenty grains, in pill or emulsion, rarely prescribed.

EMPLASTRUM GALBANI.—Galbanum Plaster.—Used to disperse scrofulous and other chronic enlargements of the joints;

over indurated glandular swellings, and as a mechanical support to the loins in ricketty children.

Preparation.—Melt galbanum and ammoniac, of each ℥j., and strain; add litharge plaster, ℥viij., yellow wax, ℥j., melted together, and mix.

A little water should be added in melting the gum resins, to prevent them from burning.

DOREMA AMMONIACUM.—Ammoniac.—The ammoniacum of the ancients was the produce of a *Ferula* growing in Morocco; that which is now employed is obtained in Persia and the Punjaub. The plant abounds in milky juice, which exudes from its broken branches; numerous beetles are stated to perforate its stems during the summer months, and the juice that flows out soon concretes; when dry it is collected, and exported to India. The finest pieces or tears are roundish masses, varying from the size of a pin's head to that of a walnut, externally yellow or brownish, and when freshly broken smooth, shining, and opaline white. Lump ammoniac consists of these tears, agglutinated by a soft brownish exudation, and often mixed with impurities. Ammoniac is hard and brittle, softening when warmed; has a faint nauseous odour, and disagreeable acrid taste, with some bitterness; it consists of seventy per cent. of resin, eighteen of gum, and a little volatile oil; is soluble in spirit, and, being a gum resin, forms a milky emulsion with water.

Botany.—A glaucous plant, six to seven feet high; root perennial; stem thick; leaves large, bipinnate; petioles downy and sheathing; umbels proliferous, racemose, partial ones globose; flowers white; ovaries woolly; mericarps with three filiform dorsal ridges, and four secondary ones.

Effects.—This gum resin is chiefly employed as a stimulating expectorant in chronic catarrhs and pectoral affections, attended with excessive secretion; it resembles senega in its action, but is decidedly inferior in power. It is usually prescribed with other remedies—squill, ipecacuanha, ammonia, or opiates; as an antipasmodic it is less relied on than the fœtid gum resins, particularly assafœtida. Externally it is applied in plasters to indolent swellings and chronic affections of the joints; it causes slight counter-irritation, bringing out a papular eruption on tender skins: still its remedial effects must chiefly be ascribed to the pressure which it exercises, promoting absorption; it is more useful when combined with mercury.

Dose.—Ten to thirty grains, in pills or emulsion.

MISTURA AMMONIACI.—Ammoniac Mixture.—This is also known as lac ammoniac. Its milky colour is caused by the suspension of the resin with gummy matter; it subsides in part on resting, and may be more perfectly mixed by using the yolk of an egg. It is employed as a vehicle for expectorants in chronic catarrh.

Dose.—f℥ss. to f℥ij.

Preparation.—Rub ammoniac, in coarse powder, one-quarter of an ounce, with distilled water, f℥viij., until the mixture assumes a milky appearance, and strain through muslin.

CONIUM MACULATUM.—**Hemlock.**—Is an indigenous biennial plant, growing in the neighbourhood of towns and villages on rubbish heaps and waste grounds, flowering in June and July; during its first year of growth it has a long slender root, with a few radical leaves, in the second year it developes its smooth spotted stem, marked by numerous dark purple stains, by which it may be distinguished from most allied plants; its leaves are dark green and shining, and the entire herb has when bruised a strong peculiar odour, compared to that of mice. The wild plant is always selected for medical purposes; its leaves and branches are directed to be gathered when the fruit begins to form, and used in preparing the extract and succus; they are also dried by exposure to the sun, or at a temperature not exceeding 120°, which should be rapidly done, so as to preserve their green colour, and then preserved with care, in closed dry vessels, not exposed to the light, or in tin canisters, as they are fit for use only so long as they retain their properties sufficiently unchanged to develope a strong odour of conia when rubbed with caustic potash; they should be gathered freshly every year, and are liable to spoil much sooner from spontaneous decomposition of their active principle. The **fruit** is now officinal, being used for preparing the tincture; it is collected and dried when fully ripe; it closely resembles anise in appearance, but the vittæ are crenated or waved, which serves to distinguish it, and it also possesses the peculiar odour of the plant. In addition to a small quantity of volatile oil, resin, and the ordinary saline and vegetable constituents, hemlock contains an alkaloid conia, which is volatile, and easily obtained by distilling the fruit with water and some caustic potash; it passes over as a yellow oil, which becomes colourless when redistilled; it has a powerful penetrating and unpleasant odour, is sparingly soluble in water, dissolves in ether and alcohol, boils at 340°, and has sp. gr. 0·98. According to Kekule and Planta, there are two homologous varieties of conia—normal conia, consisting of $C_{16}H_{15}N$; and methyl conia, of $C_{20}H_{19}N$. When normal conia is exposed to the air, it rapidly oxidizes, becoming brown, and ultimately almost solid; it perfectly neutralizes acids, and forms with them difficultly crystallized salts; its effects are nearly as poisonous as those which result from pure hydrocyanic acid.

Botany.—Root biennial, like a young parsnip; stem two to five feet high, glaucous, spotted with purple; leaves large, deep green, on long sheathing furrowed petioles, tripinnate, with lanceolate pinnatifid leaflets; umbels numerous, terminal, of many general as well as partial rays; involucre of three to seven leaflets, involucel of three leaflets on one side; margin of calyx obsolete, petals five, white with inflexed points; fruit ovate, laterally compressed; carpels with five undulated ridges.

PLANTS LIABLE TO BE MISTAKEN FOR SPOTTED HEMLOCK.

Æthusa cynapium.—Fools' parsley is smaller, and has not the peculiar odour of conium; it also wants the involucre; its involucel consists of three long unilateral pendulous leaflets, and the fruit is not crenated. This is an active poison, and has proved fatal within an hour after being taken; pain in the abdomen, sickness, spasmodic closure of the jaws, and sometimes convulsions, occur from its use.

Œnanthe crocata.—Hemlock water dropwort grows on the banks of rivers; its stem is channelled and smooth, yellowish-red at the joints only, not spotted, the juice turns bright yellow on exposure; the fruit is oblong and black, and the roots consist of tubers. Dr. Christison has shown that in Scotland this plant is far less poisonous than it has proved in England, and here; it has caused strong convulsions within twenty minutes after taking it, and death has ensued in less than an hour; it ranks amongst the most dangerous of our indigenous plants.

Phellandrium aquaticum.—Fine-leaved water hemlock, has a thick hollow stem about three feet high, its leaves are very fine, much subdivided, and dark shining green; this plant grows near rivers; it is less dangerous than the Œnanthe.

Cicuta virosa.—Water hemlock inhabits marshy places; its rootstock is hollow, and has a disagreeable smell; its stem is thick, smooth, and striated, reddish at the branching of the umbels; leaves large, pinnate, and tasting like parsley. It causes vertigo, dimness of sight, gastric pain, vomiting, convulsions, and death in a few hours.

Effects.—In poisonous doses conium causes stupor and coma, sometimes convulsions and delirium have occurred; and it appears to operate essentially as a direct sedative to the motor nerves and the muscles. The following case, recorded by Professor Bennett, illustrates its action:—A man ate it through mistake; soon after he lost power over his lower limbs, and staggered; at length he fell; when raised up, his legs dragged after him, and his arms were powerless; within two hours all voluntary motion in his limbs had departed; there was inability of swallowing, slight loss of sensation, but no convulsions; within three hours his breathing ceased, and he died gradually, asphyxiated, in a quarter of an hour after.

From experiments on animals, conia is found to act primarily as a local irritant; this is soon succeeded by swiftly spreading paralysis of the muscles, first of voluntary motion, then of the respiratory muscles of the chest and abdomen, and lastly of the diaphragm, causing speedy death, by asphyxia, from its paralyzing effects,—the senses not appearing to be affected until respiration is impaired. It has been recommended as a substitute for the preparations of conium, and also as an antidote in poisoning by strychnia; but is so extremely dangerous, that it is not likely to be much employed.

The preparations of hemlock are seldom of much value. The leaves are liable to be carelessly dried, or rendered worthless by being kept too long, or with insufficient precautions; the extract is impaired when evaporated at too high a temperature, which destroys the conia, evolving ammoniacal fumes; it deteriorates through age, and is often greatly injured by the growth of mould on its surface;

the tincture prepared from the seeds, or the succus, is least likely to disappoint us. Hemlock has long had a reputation for dispersing chronic tumors, particularly of the breast, and for healing painful ulcerations resulting from these growths; it relieves the pain of lupoid and scrofulous sores, and promotes their cure. There are no grounds for ascribing to it the slightest influence in removing cancer. It is prescribed in treating various spasmodic affections, as hooping cough and chorea; and given, combined with expectorants and anodynes, to allay the irritable and distressing cough of phthisis; it is also a favourite remedy with some practitioners, in union with quinine or full doses of opium, in phagedenic syphilis, to arrest the extension of the sloughing. Externally it can be used in ointment to inflamed hæmorrhoids, lupoid ulcers, and painful glandular tumors; and cataplasms of the bruised fresh plant, or of the extract added to linseed meal, are applied over cancerous and other painful ulcerations, or strumous glandular swellings. Dr. Garrod uses large doses of conium internally for severe spinal affections, both functional and structural; he finds it of service in paraplegia depending on a subinflammatory state of the cord, indicated by pain in the back, startings of the limbs, and incontinence of urine; it proves most useful when strychnia aggravates the symptoms.

Dose.—Of the leaves in powder, three to six grains, gradually increased until some sensible effect is observed, as giddiness, nausea, disordered vision, or headach.

TINCTURA CONII FRUCTUS.—**Tincture of Hemlock.**—Ought to be prepared from the recently dried fruit. When of good quality, it evolves a powerful odour of conia, if mixed with caustic potash.

Dose.—Twenty to thirty drops, gradually increased. Dr. Garrod commences with fʒss., and augments this up to fʒv., or more if necessary, until it produces some obvious results.

Preparation.—The bruised fruit, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, like tincture of aconite; to yield Oj.

EXTRACTUM CONII.—**Extract of Hemlock.**—Is often seriously injured during its preparation by using too high a temperature; it also becomes impaired by long keeping; hence excessive doses have been sometimes exhibited with little success, and on changing the preparation serious symptoms have ensued.

Dose.—Three to five grains, gradually augmented, if necessary.

Preparation.—Bruise the fresh leaves and young branches in a stone mortar; press the juice; heat gradually to 130°, and separate the green colouring matter by a calico filter. Heat the strained liquid to 200°, to coagulate the albumen, which is removed by filtering; evaporate the fluid by a water bath to the consistence of thin syrup; add the green colouring matter previously separated, and stir well together, evaporating at a heat not above 140°, until the extract is of proper consistence.

SUCCUS CONII.—Juice of Hemlock.—The produce obtained by expressing this and other plants will depend in great measure on the nature of the season, the period of the year they are gathered, and the freshness of the plant, as if crushed immediately upon being collected they yield a larger quantity than after being kept for a single day. A cwt. of fresh conium will give, on an average, about five and a half gallons of expressed juice. Filtration is required to separate any fecula or mucilaginous portions, which subside on the addition of the spirit.

Dose.—When properly made, this is the best preparation for internal use; it appears that fʒss. is nearly equivalent to gr. ij. of the extract; but, the succus being less altered in the process, its action will require to be watched more closely. The dose will range from fʒss. to fʒj., gradually increased.

Preparation.—Fresh leaves of hemlock, lb. vij.; bruise in a stone mortar; press out the juice, and to every three measures of juice add one of rectified spirit; set aside for seven days. Filter, and keep it in a cool place.

CATAPLASMA CONII.—Hemlock Poultice.—Is applied to painful and cancerous ulcers, being anodyne; when the fresh plant can be obtained, it is much preferred, simply bruised; or a useful extemporaneous poultice is made by adding the extract to linseed meal.

Preparation.—Hemlock leaf, powdered, ℥j.; linseed meal, ℥iij. Mix, and add boiling water, f℥x., constantly stirring.

Caprifoliaceæ.—Shrubs, or herbs, often twining; leaves opposite, exstipulate; flowers showy and fragrant; calyx four to five-cleft, with bracts; corolla various; stamens alternate with its lobes; ovary three to five-celled; fruit indehiscing, one or more celled, crowned by the calyx lobes; albumen fleshy.

SAMBUCUS NIGRA.—The Elder.—Is a well-known indigenous tree of small size, found in hedges and woods; it blossoms in April and May; its cymes of cream-coloured flowers have a faint agreeable odour, which they retain when dried; they are employed for distilling elder flower water. Ointments got by boiling the leaves of the plant or the flowers are popularly used for dressing ulcerations and blisters; they have no medical properties or advantages beyond simple cerate.

Botany.—Arborescent; stem much, but not always, oppositely branched; young branches with spongy pith; leaves pinnate, leaflets usually two pairs, with an odd one; cymes large, having many cream-coloured flowers; calyx limb five-cleft; corolla rotate, five cleft; stamens five; stigmas three, sessile; berry globular, black, three to five-seeded.

AQUA SAMBUCI.—**Elder Flower Water.**—Employed as a cosmetic, under the idea that it removes freckles; and in lotions to form a vehicle for more active remedies.

Preparation.—Fresh elder flowers, separated from the stalks, lb. x.; water, two gallons. Distil one gallon.

Cinchonaceæ.—Herbs, trees, or shrubs; leaves simple, opposite, with interpetiolar glandular stipules; inflorescence cymose; calyx adherent, entire or toothed; corolla regular; stamens attached to the corolla, alternate with its lobes; ovary two-celled; fruit inferior, separating into two cocci, indehiscent, or succulent; embryo small, in horny albumen.

CINCHONA.—**Peruvian Bark.**—The barks of several varieties of cinchona, which differ considerably in their commercial value, are included under this general term. Cinchona bark was introduced into Europe in 1639, by the Countess of Cinchon, lady of the viceroy of Peru, on her return to Spain. The discovery of its valuable medical properties has been attributed to the Peruvians; by others it is supposed that the Spaniards were accidentally induced to employ it, from observing its bitter taste, and being well acquainted with the ascertained effects of other tonics in curing malarious diseases. Soon after its importation it was successfully used by the Jesuits, by whom its reputation was rapidly spread, and it has hence received the designation of Jesuits' bark; we owe its adoption in English practice chiefly to the efforts of Sydenham, who was the first to render it popular.

The genuine species of cinchona which afford febrifuge alkaloids are separated from the closely allied genera of cascarillas and exostemmas, that are altogether devoid of medical properties, by the manner in which the fruit dehisces, the separation of the capsules extending from below upwards, whilst the fruits of the false barks dehisce from the top. The trees are described as growing either in small detached groups or separately, scattered through regions of dense forest; and the bark peelers, when they succeed in discovering a tree that is suitable for their purpose, usually cut it down close to the roots, by which means some fresh suckers soon shoot up in its place; the entire of the cortex is removed in strips; the inert periderm is split off from the thick bark of the stem, and the inner portions of it dried, being packed into small piles, and covered over with heavy weights; it constitutes the flat bark of commerce. The thinner pieces of the cinchona bark, which are obtained by stripping the branches, assume their quilled appearance from simple exposure to the sun's heat, becoming curved whilst drying; it is necessary to protect the bark from being wet with heavy rain during this desiccation, and also to prevent it heating, which results from storing it in a damp state, and greatly deteriorates its value. So soon as it is considered fit for exportation, it is packed in chests, or serons, covered with ox hide, each weighing about 150 lbs.

The native region of the cinchonas is restricted to intertropical valleys, situated along the eastern slopes of the Andes. This vast district extends from New Grenada, 10° north of the equator, to 20° of south latitude, reaching so far as Bolivia and Southern Peru; it ranges, in altitude, from 3000 to about 9000 feet of elevation, and has an average temperature varying from 59° to 68°; the trees are found flourishing under most dissimilar conditions of soil; thus the *C: condaminea* springs from barren clefts of rock, having its roots scarcely protected by a thin layer of clay; the *C: succirubra* prefers those districts that are rich and loamy; and *C: micrantha* always inhabits low moist plains, where its flowers are observed drooping in dense panicles over the river side; they all require an abundant supply of moisture, living in a climate which is described as "nine months of continuous rain, and three months of steaming heat." Some cinchonas grow to the bulk of lofty forest trees, as the *C: succirubra* and *C: calisaya;* many are of less conspicuous character, and some are mere shrubs of moderate size.

Within the last few years several successful attempts have been made to acclimatize this valuable genus in different Asiatic districts; it has been introduced by the Dutch into Java; and the exertions of Mr. Markham have led to the formation of flourishing plantations in the mountainous regions of India, where they are already prospering so far, that they bid fair to afford a steady supply for commercial purposes. The species of cinchona that are known to botanists are numerous; but it is so difficult to refer the varieties of bark to their correct source, that an arbitrary classification is usually preferred in describing them; they all belong to the following genus:—

CINCHONA.—Evergreen trees, or shrubs, with bitter bark; stipules deciduous; flowers fragrant, white or roseate; calyx five-toothed, persistent; corolla salver-shaped, five-cleft; ovary crowned with a fleshy disk; capsule grooved on both sides, dehiscing from below, septicidal; seeds numerous, with a membranous wing.

CINCHONA FLAVA.—YELLOW BARK.—The *China regia*, or monopoly bark of Bolivia, so termed from the restrictions imposed on its cutting, with the object of preventing the plant from being exterminated, is obtained from *C: calisaya;* it is imported for preparing quinia, of which it affords three to five per cent. Flat bark occurs in pieces of variable size, one to three inches broad, and from two to five lines in thickness, compact, heavy, and often curved by drying; it has a tawny-yellow colour, and breaks with short fibrous fracture; its outer surface is brown or greyish, marked by shallow longitudinal depressions; its taste is persistently bitter, with little astringence, and is gradually developed during mastication. This bark is generally found to have its suberous or cortical layer removed. Quilled yellow bark consists of rolls, often two feet in length, varying from half a line to seven lines in thickness; the epiderm is adherent, causing the exterior of the larger quills to present a rough fissured appearance, frequently marked by a conspicuous scarlet fungus; its colour is brown or grey, from adhering lichens; the outer cortex is insipid, the inner part bitter, finely fibrous, of deep cinnamon colour. This bark is used for decoction, infusion, tincture, and liquid extract. Pseudo-calisaya barks, derived from several sources, as *C: Boliviana*, *C: micrantha*, and *C: rufinervis*, are often imported, mixed with the genuine bark, from which they are distinguished by trivial external characters, and by yielding little or no quinine.

C: Calisaya.—A lofty tree; leaves petiolate, oblong ovate, three to six inches long, attenuated at the base; filaments shorter than half the length of anthers; capsule ovate, scarcely equal in length to the flowers; seeds lanceolate, with a toothed fimbriated margin. It grows in the hot valleys of Bolivia and Peru, at an elevation of 7000 to 9000 feet. The variety "*Josephiana*" is a shrub, not exceeding twelve feet high; it covers extensive tracts, and is supposed by Weddell to derive its stunted growth from the absence of forest trees, depriving it of shade and protection.

CINCHONA RUBRA.—Red Bark.—Is little used, and enters into no officinal preparations; it is exported from Guayaquil and Lima; its source is now ascertained to be the *C: succirubra*, growing on the western slopes of Chimborazo, at an elevation varying from 2500 to 5000 feet above the sea; it affords five to eight per cent. of alkaloids, three-fourths of which are quinia. This bark consists of flat or incurved pieces, less often of quills, coated with periderm; they vary from a few inches to two feet in length, and are two to six lines thick; the external surface is reddish-brown, or coloured white with lichens, wrinkled, and deeply furrowed, consisting of a thick warty outer layer; the inner portion is fibrous, of different shades of reddish-brown, and breaks with a splintery rough edge; the quills are less coarse internally, and have a comparatively smooth fracture; the taste of this bark is very bitter, though less persistent than that of yellow cinchona.

C: Succirubra.—A branching tree, sixty to eighty feet high; leaves oval acute, shining, subcoriaceous, becoming red when old; stamens rather longer than the corolla; flowers red, with white villi; capsule oblong, slightly incurved. When this tree is wounded it affords a milky juice, which changes to deep red colour, and is therefore commonly termed *Cascarilla colorada*.

CINCHONA PALLIDA.—**PALE BARK.**—The barks that are collected in the districts about Loxa, in Ecuador, produce variable quantities of quinia, quinidine, and cinchonia, some being of little medical value; they are referred to *C: condaminea*, varieties *chauarguera* and *crispa;* the quills are either single or double, from six to fifteen inches in length, and two to eight lines in diameter, the bark itself being half a line to a line in thickness; the outer surface is brown and shrivelled, with or without numerous transverse cracks or fissures, sometimes smooth; or grey-coloured, from the presence of closely adhering lichens; breaking with a short transverse fracture; the inner part is smooth, cinnamon-brown or bright orange; its taste is astringent, having a slight degree of bitterness. This variety of cinchona is distinguished in commerce as Loxa or crown bark, and is used to prepare the compound tincture of bark.

C: **CONDAMINEA.**—A tree, about eighteen feet high; leaves ovate lanceolate, four inches long by two broad, smooth above; capsule oblong, much longer than the flowers.

GREY BARK.—The cinchona barks which are distinguished in commerce by this name are not officinal; they are gathered in the Huanuco regions of Northern Peru, and are exported from Lima, packed in chests and serons. Some of this bark is of excellent quality, affording cinchonia mixed with variable but small quantities of quinia; it is usually referred to *C: nitida* and *C: Peruviana*, and always occurs in the form of quills, which are of larger size and coarser than Loxa bark, and frequently rolled somewhat spirally; it may be recognised by the edge, which often presents a sharp, obliquely cut surface; the epiderm has numerous short, irregular, transverse cracks, with flat edges, not everted or forming complete rings; it is therefore comparatively smooth, and the outer surface has a whitish or silvery grey colour; the interior being reddish or dusty brown, and presenting a fibrous structure in the larger quills; it breaks with a smooth resinous fracture, and the taste is bitter and astringent; according to Mr. Howard, its predominant feature is the abundance of tannin in it. The inferior or coarse grey bark, the produce of *C: micrantha*, is of less value; it is deep grey or glaucous, wrinkled longitudinally, and almost devoid of transverse fissures; its structure is ligneous, the decoction pale in colour, and affording a flocculent deposit on cooling. Mr. Howard finds that it contains some quinia, quinidine, and cinchonia.

C: **NITIDA.**—A tree, from twelve to forty feet high; leaves lanceolate obovate, shining, in a terminal panicle, with purplish veins, not pitted; capsule twice as long as its breadth; seeds lanceolate. 2·2 per cent. of cinchonia has been got from this bark.

C: **PERUVIANA.**—A tall tree, with lanceolate ovate leaves; the bark resembles Calisaya bark in appearance; capsule oblong, with ovate seeds. It has afforded three per cent. of cinchonia and cinchonidine.

C: **MICRANTHA.**—A tree, with large ovate or obovate leaves, glabrous above, veined with purple nerves beneath; flowers small, white or rosy; capsule measuring in length four times its breadth, lanceolate and smooth.

COMPOSITION.—The cinchona barks contain two important alkaloids—quinia and cinchonia—in combination with kinic and kinotannic acid; and by oxidation the kinotannic acid is converted into red cinchonic colouring matter; the alkaloids are each accompanied by, or convertible into two isomeric bases, termed quinidine and quinicine, and cinchonidine and cinchonicine. Another imperfectly known base, aricine, is stated to be derived from Cusco bark, procured from *C: pubescens.* The Pharmacopœia requires that all red and yellow cinchonas shall afford at least two per cent. of alkaloids, and that pale barks have one per cent. as a test of their quality.

QUINIA ($C_{40}H_{24}N_2O_4$, 6 HO).—Can be obtained in crystals by evaporating from an alcoholic solution; it is soluble in ether, chloroform, fixed and volatile oils, and boiling alcohol, but requires 350 parts of water to dissolve it. At 240° it loses its water of crystallization, and melts into a resinous mass. Its salts are intensely bitter. When exposed in solution to strong light, or treated with excess of acid, they pass into an amorphous condition. This substance is sold as amorphous quinine, or QUINOIDINE, and is obtained in considerable quantity from the solutions that remain after crystallizing out the quinine; it some instances it has afforded fifty per cent. of pure quinidine. Pasteur suggests that additional care during the period of drying the barks, and protection from sunlight, would greatly diminish its production.

Quinia is tested by adding to its solution some chlorine water, and afterwards a few drops of ammonia, which produces a bright grass-green colour; an acidulated aqueous solution of quinia exhibits a peculiar opaline tint or fluorescence, caused, according to Professor Stokes, by an internal dispersion of the chemical rays of light, which have their refrangibility altered, and become visible. A few other substances have a similar property, as the bark of the horse chesnut in decoction. Quinia is further distinguished by possessing left-handed polarizing action.

CINCHONIA ($C_{40}H_{24}N_2O_2$) is got crystallized in anhydrous quadrilateral prisms, insoluble in ether, which separates it from quinia; it also dissolves less freely in alcohol or chloroform. Heated to 320° it fuses, producing a crystalline mass on cooling. When distilled with caustic potash and a few drops of water, it affords quinoline, or leukol, a penetrating colourless oil of disagreeable odour and high refractive power; morphia and strychnia will afford a similar product. Cinchonia rotates the ray of polarized light to the right. With chlorine water and ammonia it gives a white precipitate; and its solutions are further distinguished from quinia by not being fluorescent. Its medical properties appear to be almost identical with those of quinia, with which it is often mixed in the commercial sulphate, and its salts are prescribed in similar doses.

CINCHONIDINE, which is obtained from certain varieties of cinchona, is isomeric in ultimate composition with cinchonia, and crystallizes in brilliant striated anhydrous prisms, insoluble in ether. It is distinguished by having left-handed polarization; and when strongly heated decomposes, evolving the odour of oil of bitter almonds.

QUINIDINE is extracted from quinoidine by acting on it with ether, and spontaneously evaporating the solution; it is isomeric with quinia, but crystallizes with 4 HO; is much loss soluble in cold water, and more easily dissolved by ether; it is distinguished by having right-handed polarizing action, and its oxalate will dissolve freely in water.

Quinicine results from the action of heat on quinia and quinidine. It is precipitated by alkalies as a resinous mass, and forms bitter uncrystalline salts, metameric with those of quinia; it rotates a ray of polarized light feebly to the right.

Kinic acid ($C_{28}H_{20}O_{20}$, 2 HO) is got by adding milk of lime to decoction of bark until it reacts alkaline. The alkaloids and kinotannic acid precipitate. The kinic acid dissolving, combined with lime, can be crystallized, and, the lime being removed by oxalic or sulphuric acid, is obtained pure in colourless crystals. Distilled with peroxide of manganese and sulphuric acid, a yellow pungent substance, kinone, is produced, $C_{12}H_4O_4$, which forms a distinctive test of its presence.

Kino-tannic acid ($C_{28}H_{19}O_{17}$) is less astringent than ordinary tannin, and becomes green with persalts of iron. It rapidly absorbs oxygen, forming the red colouring matter of bark, termed red cinchonic.

Aricine has been incompletely examined. It crystallizes in white needles, is soluble in ether, and with nitric acid strikes an intense and characteristic green colour. It is said to have been obtained from bark brought from Arica or Cusco.

Purity.—The following process of Wöhler's is now adopted to determine the value of cinchona barks:—

Boil gr. c. of the yellow bark, in fine powder, with distilled water, f℥j.; hydrochloric acid, ten minims, for a quarter of an hour; macerate for twenty-four hours; transfer to a small displacement tube, and when fluid ceases to percolate, add at intervals about f℥jss. of similarly acidulated water until it passes through free of colour; add to the fluid, solution of subacetate of lead until all colouring matter is removed, taking care that the fluid remains acid in reaction; filter, and wash with a little distilled water; to the filtrate add about gr. xxxv. of caustic potash, or as much as will nearly redissolve the precipitate first formed, and afterwards pure ether, fʒvj.; shake briskly; remove the ether, and repeat the process twice with ether, fʒiij., or until a drop of it leaves scarcely any residue on evaporation; lastly, evaporate the ethereal solutions in a capsule. The residue from yellow cinchona should weigh not less than gr. ij. when dry; it consists of nearly pure quinia, and is readily soluble in dilute sulphuric acid.

Red bark affords at least two per cent. of alkaloids, substituting chloroform for the ether, in which cinchonine is insoluble. Of pale bark, 200 grains, similarly treated with chloroform, should give at least gr. ij. of alkaloids.

Effects.—Cinchona may be regarded as the type of a vegetable tonic, that is, a drug which, administered for a lengthened period, is capable of increasing the vigour of the digestive and assimilative functions, and producing augmented bodily strength from a healthy development of tissues. The effects continue after the medicine is omitted; and it appears possible that the results are primarily caused by its operating on the nervous system. Tonics are found by experience to be of most benefit when the body is debilitated; and, possessing no intrinsic nutritive properties, their use demands suitable food, and an adequate time for its absorption, and they require to be persevered in sufficiently long to secure the full advantages that they are capable of affording.

Preparations of cinchona are prescribed during the early stages of convalescence from febrile and acute diseases; in affections that are attended with profuse and exhausting mucous or purulent discharges, as chronic and mammary abscesses, leucorrhœa, and bronchitic attacks, and in the treatment of many surgical maladies, or after operations where the strength is reduced; also in erysipelas, so soon as the primary acute symptoms are removed, or where there is a typhoid or gangrenous tendency, or a failing pulse, and other evidences of asthenia; and in all cases of debility, provided the stomach and digestive organs are not in an over-irritable state, when they are either inadmissible, or the mildest preparations are alone employed, such as the infusion of bark given whilst effervescing.

For cases of acute rheumatism bark has been frequently recommended, but has never come into general use; in the rheumatic affections that originate in gonorrhœa, it is prescribed as a vehicle for oil of turpentine, which forms a valuable though most unpleasant remedy for these obstinate attacks. In scrofulous affections, chronic enlargements of the glands, and strumous ophthalmia, preparations of bark in combination with a soluble mercurial salt, as the chloride of mercury, are often of great service; and also prove useful in treating obstinate eczematous and lupoid eruptions, and in the protracted neuralgic pains that are liable to occur from the injudicious use of mercury with rheumatic patients. In the continued fevers of this country cinchona is chiefly used for exceptional cases, to relieve any excessive tendency to sweating; in unusual and early debility, where tonics are indicated; and during the commencement of convalescence, to restore the appetite, and assist recovery. Formerly it was supposed to possess a specific influence over mortification, and was heaped upon the dead tissues and into the stomach as if the cure depended on the quantity that was used. It is of service only so far as its tonic effects reach, and moderate doses will accomplish all the benefit that it is capable of exerting.

The antiperiodic properties of bark in checking the recurrence of intermitting diseases are sufficiently established, yet its mode of operation still remains as obscure as the nature of those affections; preparations of arsenic exercise a similar influence, and they are claimed to be specifics—a term which must be considered merely provisional until we understand their manner of action. There are few cases of ague that will resist the judicious use of bark, or of its preparations; hemicrania, violent neuralgic pains, brow ague, and other diseases that are common in malarious districts, and assume an intermittent type, more or less distinct, as diarrhœa and dysentery, are curable by it; and even where the intermitting character is not so obvious, as in attacks of remittent fever, it proves of extreme service. When treating recent simple intermittents, it is usual to prescribe an emetic, or some purgative to evacuate the bowels, previous to commencing with bark, which is always taken during the apyrexial stage, or intermission; it often succeeds in arresting the disease immediately; and should the paroxysms recur, they are in general found to be milder, and perhaps deferred to a later period. In complicated intermittents, whenever there is a complete exemption from fever, bark may be given without delay; and when the existing inflammation is attended with typhoid symptoms, or assumes an asthenic type, it is not necessary to wait for a distinct intermission. There are two different methods of employing it, either in moderate doses, used at short intervals during the entire apyrexial stage, or in larger quantities, exhibited prior to the expected recurrence of the paroxysms; it is of great importance that the remedy agrees with the stomach, and aromatics and opiates are often added to it with decided advantage.

Quinia is frequently preferred to powdered bark, from the smaller dose that is required to be taken, and its freedom from inert ligneous tissue; but the other constituents that are found in cinchona can hardly be considered devoid of medical properties; and good powdered bark sometimes proves successful in cases where quinia has failed; the great objections to it are its liability to adulteration, and to the substitution of inferior kinds, its unmanageable bulk, and the disgust which it excites when exhibited in powder. For the treatment of intermittent fever, yellow or red barks are preferred, as they contain the largest quantity of quinia; the finer descriptions of pale bark are perhaps more useful for ordinary tonic purposes, as they are less astringent, and therefore agree better with the stomach and bowels.

DOSE.—Of powdered bark the average tonic dose is ten to twenty grains, thrice daily; for treating intermittents, the medium quantity is sixty grains, repeated more or less frequently.

DECOCTUM CINCHONÆ FLAVÆ.—DECOCTION OF YELLOW BARK.—Water, boiled with yellow cinchona, extracts the kinates of quinia, cinchonia, and lime, also gum, starch, and soluble red cinchonic matter, a portion of which is united with the cinchona alkaloids; as the decoction cools, a flocculent deposit takes place, which Soubeiran found to consist of sixty parts insoluble in alcohol, chiefly composed of red cinchonic and starch; the residue, eighty-six parts, dissolved in alcohol, and contained the cinchona alkaloids; much of this will be removed by the filtration through calico now ordered in the formula. The bark is not exhausted by simple decoction; it affords a more energetic solution, by using acidulated solutions, whilst alkalies extract a less active though deeper-coloured preparation.

This decoction is largely used as a tonic; its flavour is much improved by the addition of tincture of orange.

DOSE.—f℥ss. to f℥ij., thrice in the day.

PREPARATION.—Yellow bark, in coarse powder, ℥j.; boiling water, Oj.; boil for ten minutes in a covered vessel. When cool, strain through calico, and add sufficient distilled water through the filter to make up f℥xvj.

INFUSUM CINCHONÆ FLAVÆ.—Infusion of Yellow Bark.—A favourite tonic in dyspeptic affections, and those forms of debility where a mild bitter is indicated; it is often employed in effervescence with lemon juice and bicarbonate of potash, or carbonate of ammonia; much of the cinchona alkaloids are left undissolved in the bark.

Dose.—f℥ss. to f℥ij., three or four times in the day.

Preparation.—Yellow bark, in coarse powder, ℥ss.; boiling distilled water, f℥x. Infuse in a covered vessel for two hours, and filter through paper.

TINCTURA CINCHONÆ FLAVÆ.—Tincture of Yellow Bark.—Generally added to the infusion or decoction; or prescribed as a solvent for corrosive sublimate; spirit will extract all the astringent and bitter principles of cinchona bark.

Dose.—fʒj. to fʒij.

Preparation.—Yellow bark, in coarse powder, ℥iv.; proof spirit, Oj., prepared by maceration and percolation, like tincture of aconite; to yield Oj.

TINCTURA CINCHONÆ COMPOSITA. — Compound Tincture of Bark.—A more agreeable, but less powerful tonic than the simple tincture, being prepared with pale bark, and containing half the quantity that enters into the simple tincture. It is commonly known as Huxham's tincture of bark.

Dose.—fʒj. or fʒiij.

Preparation.—Pale bark, in coarse powder, ℥ij; bitter orange peel, cut small, and bruised, ℥j.; serpentaria bruised, ℥ss.; saffron, gr. lx.; cochineal, in powder, gr. xxx.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite, to yield Oj.

EXTRACTUM CINCHONÆ FLAVÆ LIQUIDUM.—Liquid Extract of Yellow Bark.—This preparation contains the soluble constituents of bark in a concentrated state, and is a useful form for administering cinchona. According to the proportions employed, each fʒj. should represent ℥ss. of bark; but as the residue cannot be fully exhausted, and contains a quantity of undissolved alkaloids, it is less strong.

Dose.—Ten to thirty drops, thrice daily.

Preparation.—Yellow cinchona, in coarse powder, lb. j.; distilled water, Oij.; macerate for twenty-four hours, stirring frequently; pack in a percolator, and add more water until Oxij. are collected, or a sufficient quantity to exhaust the bark; evaporate, at a temperature not exceeding 160° to Oj.; filter though paper, and continue the evaporation to f℥iij., or until the sp. gr. of the fluid is 1·2; when cold, add rectified spirit, f℥j., gradually, constantly stirring. The sp. gr. should be about 1·10.

QUINIÆ SULPHAS.—**Sulphate of Quinia** ($C_{40}H_{24}N_2O_4$, $HO, SO_3 + 7\,HO$).—This is a light white crystalline substance, composed of silky, odourless, intensely bitter crystals, sparingly soluble in cold water, unless acidulated with sulphuric acid, and readily dissolved in thirty parts of boiling water, or eighty of rectified spirit; its aqueous solution has a peculiar opaline blue fluorescent tint; and if treated with chlorine water, and then ammonia added, it forms a bright emerald-green colour; by exposure to dry air this salt loses eight per cent. of its water of crystallization; heated to 212°, it becomes luminous, and melts at 240°.

Preparation.—Place yellow bark, in coarse powder, lb. j., in a porcelain basin, and thoroughly moisten it with dilute sulphuric acid; after macerating for twenty-four hours, pack in a displacement apparatus, and percolate with a dilute solution of hydrochloric acid, f℥iij., in distilled water, Ox., until the solution which drops through is nearly devoid of bitter taste; into this liquid pour solution of soda, Oiv.; agitate well; let the precipitate completely subside; decant the supernatant fluid; collect the precipitate on a filter, and wash it with cold distilled water until the washings cease to have colour; transfer the precipitate to a porcelain dish, with distilled water, Oj., and, applying a steam heat, gradually add dilute sulphuric acid, until nearly the whole of the precipitate has been dissolved, and a neutral liquid obtained. Filter the solution, whilst hot, through paper; wash the filter with boiling distilled water; concentrate till a film forms on the surface of the solution, and set aside to crystallize; dry the crystals on filtering paper, without applying heat.

Yellow bark, acidulated with sulphuric acid, and exhausted by an aqueous solution of hydrochloric acid affords its alkaloids mixed with colouring matter; caustic soda precipitates the alkaloids, keeping the colouring in solution; the quinia and any cinchonia present are then removed as a precipitate, converted into sulphates, and separated by crystallizing; the sulphate of quinia, being least soluble, crystallizes out first, leaving the cinchonia still in the solution.

Adulterations.—Cinchonia, salicine, gum, starch, sugar, and earthy impurities, are stated to occur in adulterated quinine. The following test of Liebig's will detect cinchonia, which is most often met:—Dissolve ten grains in water, f℥ss., with ten minims of dilute sulphuric acid; precipitate the quinia by ammonia, and agitate with f℥ss. of pure ether; this should perfectly redissolve it, without producing any crystalline matter floating on the lower watery stratum into which the fluid separates; the upper ethereal solution contains the quinia. If removed by a pipette and evaporated, it should leave a residue which, dried in the air without heat, weighs 8·6 grains. Salicine, the bitter principle of the willow, becomes deep red on the addition of sulphuric acid; quinia is rendered feebly yellow. I have never found this substance present. Sugar is detected by precipitating quinia and its sulphuric acid from solution by a salt of barytes, removing any excess of the barium by a stream of carbonic acid, and tasting the solution. Gum is insoluble in spirit; starch will become blue with tincture of iodine; and earthy matters remain on incinerating the quinia.

Effects.—Twelve grains of quinia are equivalent to an ounce of good yellow bark; when taken, it becomes absorbed, and can be detected in the urine; in excessive doses it is liable to derange the stomach, and induce nausea, or febrile symptoms, with furred tongue, headach, and those nervous effects which are termed quinism, that must be more fully described afterwards; though in many cases no ill effects have resulted from employing large quantities of it. Quinia is frequently preferable to cinchona for medical use, from its definite composition, its portability, and the absence of inert woody fibre, its disadvantages are its high price, the loss of the astringent and aromatic principles contained in bark, and the waste that occurs in its preparation of cinchonia and other alkaloids. It possesses in an eminent degree the properties of a pure tonic, and is prescribed in all those affections for which cinchona is found useful; it can be given in pill, or preferably in solution, dissolved by dilute nitric or sulphuric acid, and a little syrup and tincture of orange will greatly improve its flavour; the acid infusion of roses is also a favourite vehicle; if prepared with dilute nitric acid it forms no precipitate, but with dilute sulphuric acid it causes an insoluble tannate to fall, which, however, is an efficacious compound readily dissolving in the stomach.

In the treatment of uncomplicated intermittents, quinia is used during the apyrexial stage, in doses of one to five grains, taken three or four times in the day; so that from fifteen to forty grains are given whilst the intermission lasts; the addition of small quantities of opium and of aromatics is of advantage when the stomach is unsettled, or the bowels are irritable. Another mode of employing it is in considerably larger doses, as twenty to thirty grains, or upwards, before the paroxysm of ague is expected to recur; and should this not produce its full effects, ten grains additional are used every hour or so, until they are observed; it causes some degree of cerebral disturbance —a sensation of constriction in the head, ringing in the ears, deafness, dimness of vision, and giddiness, with lowering of the pulse, and diminished general sensibility; loss of speech and sight, and extreme prostration, have sometimes resulted, which generally pass off after a few days, the deafness continuing longest. The advocates of this practice state that it is an economic and rapid plan of treatment, more certain in its effects than smaller doses, and less likely to be followed by relapses.

Another and more important use of quinia in these lands is for treating congestive bronchitic attacks, and asthenic pneumonia such as has prevailed extensively of late years, given in doses of three to five grains at intervals of every four or six hours. It appears to exercise a special tonic influence over the engorged lung, which I have often considered similar to its well-known action in ague in diminishing the size of the congested spleen; those who have tried its effects know that it is a reliable and valuable remedy.

An ointment of quinia is occasionally applied to chronic eczema, and for dressing indolent ulcers; it presents no advantages over other mild stimulant remedies. When the stomach will not retain quinia, it can be given with nearly the same degree of benefit in enema, mixed with a few drops of laudanum, and some starch.

Dose.—The average dose as a tonic will be from half a grain to three grains, thrice daily.

TINCTURA QUINIÆ COMPOSITA.—Compound Tincture of Quinia.—The solution is facilitated by digestion in a warm place; each f℥j. should be equivalent to one grain of sulphate of quinia, but from eight to ten per cent. remains undissolved. A preferable formula for private use is got by substituting good sherry for the tincture of orange, and flavouring with about f℥j. of that tincture to the pint.

Dose.—fʒj. to f℥ss.

Preparation.—Sulphate of quinia, 160 grains; tincture of orange peel, Oj. Digest for seven days and strain.

UNCARIA GAMBIR.—Catechu Pallidum.—Pale catechu is an extract obtained from the leaves and young shoots of this shrub; it is prepared at Singapore, and other parts of the Eastern Archipelago, by boiling or infusing with water, and evaporating the strained decoction to obtain a solid extract, which is moulded into cylindrical or cubical shapes. The description that is usually imported consists of cubes about an inch in diameter, or masses formed from cohering cubes; externally these are reddish-brown, and yellow or pale ochry-red within, having no odour, and easily broken, with a dull earthy fracture; under the microscope it is found to consist of minute crystals of catechin mixed with a mucilaginous substance; it also contains a considerable quantity of catechu tannin. Catechin, $C_{20}H_9O_8$, HO, is not soluble in cold water; it forms a dark green precipitate with perchloride of iron.

Test.—It should be entirely soluble in boiling water; and the decoction when cool does not become blue with iodine, if free from starch.

Botany.—A climbing shrub; leaves on short petioles; the lower peduncles sterile, becoming hooked spines; florets green and pink, in loose heads; capsules stalked, two-celled, many-seeded, the seeds winged.

Effects and Dose.—Similar to those of the dark-coloured catechu got from the *Acacia catechu*. Both are used to make the infusion, tincture, and compound powder; but pale catechu is employed exclusively in the lozenge.

TROCHISCI CATECHU.—Catechu Lozenges.—Are used in relaxed sore throat, and to restrain slight attacks of diarrhœa. Each lozenge contains about one and a quarter grains of catechu.

Preparation.—Pale catechu, ℥ij.; refined sugar, lb. j.; gum arabic, ℥j.; all powdered. Mix; add tincture of capsicum, f℥ss.; distilled water, enough to form a mass. Divide into 720 lozenges, and dry in a hot air chamber with moderate heat.

CEPHAELIS IPECACUANHA.—**The Ipecacuan Plant.**—Grows in moist shady localities in the valleys of Brazil; its roots are gathered during the period of flowering, from January to March, and when dried are exported from Rio. Ipecacuan occurs in contorted pieces, two to five inches long, as thick as a quill; its cortical portion is knotty or annulated, marked by deep circular fissures, so that it has been compared to beads on a string; the inner woody meditullum is tough, paler, contains little of the active principle, and forms about one-fifth of the entire weight; the colour of the cortex varies, being reddish-brown, or pale grey; non-striated portions are sometimes imported, which are considered to be the subterranean stem of the plant, as annulated roots are occasionally attached to them. Ipecacuan has an acrid bitter taste, and faint nauseous smell, from the presence of some odorous matter, soluble in ether, which is very disagreeable if concentrated; besides starch, ligneous tissue, and other vegetable matters, it affords a substance allied to tannin, termed ipecacuanhic acid, and a feeble base, emetine; when pure, this is white, without smell, slightly bitter, nearly insoluble in cold water unless acidulated; but dissolving in rectified spirit or chloroform, and forming difficultly crystallized salts with acids; one-sixteenth of a grain will act as a powerful emetic, and large doses of it are poisonous; emetine is obtained from an alcoholic extract of the root by acting on it with dilute sulphuric acid; after filtering the liquid to remove oily matters, water of ammonia is added in slight excess; agitation with chloroform dissolves out the emetine in an impure state from the precipitate thus got; the solution is then evaporated; it is converted inso a salt by an acid, decolorized with animal charcoal, and finally precipitated on adding an alkali.

Botany.—An herb, root perennial; stem sending out runners, at length erect, shrubby, two to three feet high; leaves four or six, at the end of the branches; petioles pubescent, with erect stipules; peduncles solitary, erect when flowering, drooping with the fruit; flowers in heads, with a one-leaved deep cleft involucre, and one bract to each flower; calyx five-toothed; corolla funnel-shaped; stamens five; berry fleshy, dark violet, two-celled, and two-seeded.

Adulterations.—A striate black ipecacuan, the root of *Psychotria emetica* of New Grenada; and a white undulated root, having no annuli, and containing much starch, got from the *Richardsonia scabra* of Brazil, are described; their effects are similar to, but weaker than, true ipecacuan; they are of no commercial importance.

Effects.—Susceptible individuals suffer from dyspnœa and profuse expectoration on inhaling its powder in the smallest quantity; in repeated doses it exercises a tonic influence over the bronchial mucous membrane, when congested, promoting its secretions, and controlling their amount if excessive; in acute bronchitis it is given with most benefit in full nauseating doses; for chronic attacks smaller ones are generally preferred; with young children vomiting is well borne, and will often cut short an incipient bronchitis or threatened seizure of croup; during the paroxysm of asthma it is employed as an emetic to relax spasm, and afterwards, if necessary, given to maintain a state of nausea; but I have generally found lobelia preferable in this disease; for hooping cough it is usually combined with narcotics—as opium or belladonna, and alkalies, and is most serviceable in the earlier spasmodic stage. Some practitioners rely on it for controlling hæmorrhage from the lungs, taken at short intervals, in doses of two to six grains; it is unsuited for cases of advanced pulmonary disease, or when there is much vascular excitement; in dysentery and diarrhœa its decoction was formerly in high repute; it is still largely given in India, and those who have tried it consider its effects most decided in acute attacks, for which purpose large doses are prescribed, with opiates, and occasional purgatives if necessary; in milder cases, given in the form of Dover's powder, it relieves pain and tenesmus, and determines to the skin, being diaphoretic.

In doses of twenty grains or upwards, it is a safe and certain emetic, operating within twenty minutes, causing full vomiting; it is prescribed when we wish to relieve the stomach from undigested food, and for the gastric affections of children; it does not exert the depressing influence of tartaric emetic, and has therefore less control over acute inflammations. In some forms of jaundice, depending on gastric derangement, or on defective hepatic secretion, emetics of ipecacuan, given an hour after dinner every second or third day, are a simple and effectual remedy.

Applied in liniment, mixed with three or four parts of olive oil, thrice daily, it rapidly causes an eruption of small vesicles, and can be used as a counter-irritant.

Dose.—Gr. ss. to gr. j., as an expectorant; to nauseate, two to five grains; for an emetic fifteen to twenty grains; its action is promoted by the use of diluents. Delicate persons are affected with much smaller doses; and gr. j. will suffice for young infants.

PULVIS IPECACUANHÆ CUM OPIO.—**Powder of Ipecacuan and Opium.**—Or Dover's powder, was originally made with nitre; it operates as a useful anodyne and diaphoretic in dysenteric attacks, diarrhœa, rheumatism, and recent catarrhs; it should not be given when the stomach is irritable, or in cases where opiates are contraindicated; its action as a sudorific is greatly promoted by keeping the surface of the body warm.

Dose.—Five to ten grains, usually in pill. For infants under one year, gr. ss. is a full dose. The sulphate of potash, from its comparative density, is liable to separate when the powder is long kept, and before dispensing it the bottle should always be well agitated.

Preparation.—Rub opium and ipecacuan, each in fine powder, ʒss., with sulphate of potash, ʒiv.; pass through a fine sieve, and keep in a stoppered bottle.

VINUM IPECACUANHÆ.—Ipecacuan Wine.—Generally employed for children, where a simple emetic is required; or added to expectorant mixtures.

Dose.—For children, fʒj., given every ten or fifteen minutes will cause vomiting. Adults require fʒj. to f℥ij. As an expectorant, the dose is from ten to forty drops.

Preparation.—Bruised ipecacuan, ʒj.; sherry, Oj.; macerate for seven days, with occasional agitation; strain; press, and filter.

Valerianaceæ.—Herbs; leaves opposite, exstipulate; flowers cymose; calyx superior, obsolete, or forming a pappus; corolla tubular, sometimes spurred; stamens one to five on corolla; ovary with one perfect and two abortive cells; ovules pendulous; fruit dry, embryo without albumen.

VALERIANA OFFICINALIS.—Valerian.—The root of this plant is employed; it consists of a short tuberculated rhizome, with numerous round root-fibres, two to six inches long, of light brown colour externally, having a fœtid characteristic odour, somewhat like serpentaria; its taste is warm, bitterish, and acrid. There are two varieties recognised: the larger grows wild, in moist localities, near rivers, and is less valued; the smaller is found on dry heaths, its roots are more odorous, and its leaves entire, or only slightly toothed. It is also cultivated in Derbyshire, and the roots collected in September for use. Besides woody matters, mucilage, and ordinary vegetable products, it yields a volatile oil, and valerianic acid. The oil is obtained by distilling with water; it is first clear, and not unpleasant; by keeping, it becomes thick and disagreeable. It consists of a hydrocarbon allied to the *borneène*, got in Borneo camphor, and valerol which is less volatile than borneene, and left on redistilling the oil; it has the odour of hay, and, by absorbing oxygen, developes valerianic acid.

Valerianic Acid ($C_{10}H_9O_3, HO$).—Can be procured directly by distilling valerian root with water acidulated by dilute sulphuric acid; or more abundantly when the oil of valerian it contains is oxidized by being previously digested with bichromate of potash and dilute sulphuric acid; the product is identical with that obtained from fousel oil, or amylic alcohol (see Valerianate of Soda); it is a colourless oil, sparingly soluble in water, having a strong odour of valerian, and distilling unchanged at 347°; it bears a similar chemical relation to amylic alcohol to that which acetic acid does to wine alcohol.

Botany.—Perennial, developing herbaceous stems, two to four feet high; leaves pinnate, leaflets lanceolate, seven to ten pairs, dentate or entire; calyx limb involute, developing a plumose deciduous pappus with the fruit; corolla flesh-coloured, not spurred; stamens three.

Effects.—Its action resembles that of camphor, and at one time it bore a high reputation in epilepsy; large doses may cause nausea, headach, or giddiness; and its odour is well known to produce excitement, and apparent pleasurable sensations with cats. It is chiefly used in nervous and hysterical affections, and sometimes for chorea; on the Continent it is prescribed as a stimulant for low forms of fever. Its virtues deteriorate by keeping; it should therefore only be used when fresh and well preserved. The oil, given in doses of two or three drops, may be substituted for it with advantage in most cases.

Dose.—In powder, twenty to sixty grains; this is unpleasant from its bulk, but is considered a good mode of administration.

INFUSUM VALERIANÆ.—Infusion of Valerian.

Dose.—f℥j. or fʒij.

Preparation.—Bruised valerian, gr. cxx.; boiling distilled water, f℥x. Infuse in a covered vessel for one hour, and strain.

TINCTURA VALERIANÆ.—Tincture of Valerian.—

Used as an adjunct to the infusion, in doses of f℥j. to fʒiij.

Preparation.—Bruised valerian, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation like tincture of aconite; to yield Oj.

TINCTURA VALERIANÆ AMMONIATA.—Ammoniated Tincture of Valerian.—

Prescribcd as an antispasmodic and stimulant in hysterical and nervous affections, in doses of fʒj. to fʒij., properly diluted.

Preparation.—Macerate bruised valerian, ℥ijss.; aromatic spirit of ammonia, Oj., for seven days, in a well closed vessel. Filter, and add enough aromatic spirit of ammonia to make Oj.

Compositæ.—Herbs or shrubs; leaves exstipulate, alternate or opposite; florets hermaphrodite or unisexual; flowers in capitula, surrounded by involucres, and seated on receptacles, whence paleæ may arise; calyx adherent, entire or pappose; corolla regular or ligulate; stamens syngenesious; ovary inferior, one-seeded, with one style and bifid stigma; ovule erect, exalbuminous. Jussieu subdivides this family into

Chicoraceæ.—Florets perfect and ligulate. Examples—

Taraxacum dens leonis.	Lactuca sativa.

Cynaracephalæ.—Florets tubular, homogamous, or those of the ray neuter; style swollen below its branches.

Corymbiferæ.—Florets homogamous, and usually tubular, or those of the ray filiform, or tubular and pistilliferous, or ligulate; style not swollen. Examples—

Anthemis nobilis.	Artemisiæ.	Arnica montana.

ANTHEMIS NOBILIS.—**Chamomile.**—Is indigenous, growing on open pastures and commons, flowering from July to September; it is also cultivated in England and the North of Ireland, for medical use; two varieties are distinguished, termed single and double: in the double all the florets have become ligulate; the flowers are larger, whiter, and more valued from their appearance, but they are less fragrant, and yield less oil than the single flowers, in which the ray florets are ligulate, and those of the centre yellow and tubular; both afford a bitter extract, and a volatile aromatic oil, which are officinal.

Oleum anthemidis is distinguished as "English" oil of chamomile, distilled from the flowers, and described as pale blue or greenish-blue, gradually becoming yellow; at Mitcham this oil is obtained from the entire plant, not the flowers alone; two kinds of double chamomile being grown, one of which yields a yellow oil; the other a blue one, that by keeping gradually changes in colour to brownish-yellow; they have a powerful odour of the plant, and consist of a hydrocarbon, and an oxidized portion, that is converted into angelic acid by potash. Much of the oil of chamomile that is sold is imported from the Continent, and has a deep blue colour; its source appears chiefly to be the *Matricaria chamomilla.*

Botany.—Root perennial, with long fibres; stems procumbent, erect when cultivated, a foot long, branched, hollow, and leafy; leaves doubly pinnate; leaflets linear, slightly downy; flower heads with a convex yellow disk; florets of disk hermaphrodite, tubular, five-toothed; of ray, female and ligulate; receptacle conical, with membranous paleæ; involucre imbricate in few rows.

Effects.—Chamomile is an aromatic bitter, prescribed in dyspepsia and general debility, and often combined with antacids or saline aperients; its infusion, if taken warm, will excite vomiting, and is sometimes used to promote the action of emetics. The oil is added to purgative pills, to prevent griping, and relieve flatus. Externally, the flowers are commonly employed in stupes; their sole benefit is that of retaining the heat for a time. If the hot moist flowers are squeezed dry, and placed between thin folds of linen, they form a useful light poultice over inflamed and tender parts.

INFUSUM ANTHEMIDIS.—Infusion of Chamomile.—Ginger is frequently added to this infusion; its dose is f℥ss. to f℥ij.

Preparation.—Chamomile flowers, ℥ss.; boiling distilled water, f℥x. Infuse in a covered vessel for fifteen minutes, and strain.

EXTRACTUM ANTHEMIDIS.—Extract of Chamomile.—Is prescribed when it is advisable to administer chamomile in a pilular state.

Dose.—Five to ten grains.

Preparation.—Chamomile flowers, lb. j.; digest in distilled water, Ovj., for twelve hours; pour off the clear liquor, and press; again digest, and press as before; evaporate the mixed liquids by a water bath to a proper consistence, adding oil of chamomile, fifteen minims, at the end of the process.

ARTEMESIA.—Santonica, or Semen Contra.—Is imported from Russia, and stated to come from Bucharia. Guibourt ascribes it to the *A: santonica*, but other species appear to supply part of it. It consists of small unexpanded flower heads, rather more than a line long, and nearly half a line in breadth, mixed with broken peduncles, resembling seeds in appearance, and consisting of imbricated involucral scales with a green midrib, enclosing four or five tubular flowers. It has a greenish colour, strong aromatic odour, and disagreeable bitter taste. To distinguish it from Barbary worm seed, there is a special test given that the flower heads are not round or hairy; this variety is considered to be derived from *A: Judaica*: both appear to have similar properties. Worm seed affords volatile oil, resinous matters, and two per cent. of santonine. It can be given as a vermifuge in doses of thirty to sixty grains, repeated night and morning for a few days, and followed by a brisk purgative; it answers best for expelling the round worm.

SANTONINUM.—Santonine ($C_{30}H_{18}O_6$).—A neutral principle, obtained from Santonica, crystallizing in flat rhombic colourless prisms, becoming yellow in sunlight; it fuses and sublimes by moderate heat, is scarcely soluble in cold water, and therefore has a feeble bitter taste; it dissolves sparingly in boiling water, and freely in chloroform or rectified spirit, its solution being powerfully bitter. It is not soluble in dilute mineral acids.

Preparation.—Boil bruised Santonica, lb. j., with distilled water, one gallon, and slaked lime, ℥v., in a copper or tinned iron vessel for an hour;

strain through a stout cloth, and express strongly; boil the residue with half a gallon more water, and slaked lime, ℥ij.; mix the strained liquids, let them settle, decant the fluid from the deposit, and evaporate to Oijss.; to the liquid when hot add hydrochloric acid, until the fluid becomes slightly and permanently acid, and set aside for five days, that the precipitate may subside; remove by skimming any oily matter floating on the surface, and carefully decant the greater part of the liquid from the precipitate. Collect this on a paper filter, wash with cold distilled water till the washings pass colourless, and nearly free from acid reaction; then, with solution of ammonia, f℥ss., previously diluted with f℥v. of distilled water, and lastly with cold distilled water, till the washings pass colourless; press the filter containing the precipitate between folds of filtering paper, and dry it with a gentle heat; scrape the dry precipitate from the filter, and mix it with purified animal charcoal, sixty grains; pour on these rectified spirit, f℥ix., digest for half an hour, and boil for ten minutes; filter while hot, wash the charcoal with f℥j. of boiling spirit, and set the filtrate aside for two days in a cool dark place, to crystallize; separate the mother liquor from the crystals, and concentrate, to obtain a further product; collect the crystals, let them drain, redissolve in boiling rectified spirit, f℥iv., and crystallize, as before; lastly, dry the crystals on filtering paper in the dark, and preserve in a bottle protected from light.

The santonine and resinous substances are dissolved by the lime in water; after removing the vegetable material, the lime is neutralized with hydrochloric acid, and a precipitate obtained of impure santonine, from which ammonia washes off all resinous portions; and on filtering the santonine is collected. It requires to be further purified with charcoal and crystallization from an alcoholic solution, to obtain it quite pure.

EFFECTS.—Santonine is an anthelmintic, particularly effectual in expelling the *Ascaris lumbricoides*, for which purpose Kuchenmeister prefers to use the santonate of soda, a soluble crystalline salt easily decomposed by acids, which is given in doses of eight to ten grains to adults, mixed with a little sugar. When santonine is taken internally it is liable to affect the vision, causing white objects to assume a peculiar yellow tint, and converting blues into green, and red into orange; this change does not continue long, passing off after a few hours. Some cases are recorded which show that this substance is not always safe when given in an overdose, exciting violent abdominal pain, severe purging and vomiting, with cold sweats, prostration, and spasms of the extremities. The free administration of lemon juice and acids would probably be the best treatment for those symptoms.

DOSE.—One to four grains, taken twice daily, for three or four doses; for children it is conveniently given in the form of lozenge; half a grain will suffice for those who are under ten years of age.

ARNICA MONTANA.—ARNICA.—This plant is a native of Southern Europe, growing in meadows; the entire plant has an unpleasant aromatic odour and acrid nauseous taste; its roots are collected in September; they are brown coloured, consisting of a cylindrical caudex, two or three inches long, with numerous rootlets; a volatile oil of blue colour has been obtained from them, with resin, and extractive matter, said to be similar to the cystissin of laburnam; and an alkaloid, arnicine (Bastick), forming crystalline salts.

Botany.—Perennial; stem hairy, about a foot high; leaves obovate, entire, five-nerved; stem one to three flowered; florets of ray ligulate, female; of disk regular and hermaphrodite; with rough glandular involucre; achenes somewhat cylindrical; pappus of close rough hairs.

Effects.—Tincture of arnica is a valuable application to recent sprains and ecchymoses; it promotes the absorption of effused blood, prevents discoloration, and relieves pain and stiffness; it may be used on lint, diluted with one to eight parts of water. In America, extract of arnica is employed as a strengthening plaster, and a stimulating remedy to sprains, one-tenth of a soft alcoholic extract of the flowers being mixed with adhesive plaster. Internally it is sometimes prescribed for nervous affections, amaurosis, paralysis, and chronic rheumatic attacks; and has been found useful in gastralgia, and some forms of headach. Further observations are required to determine its effects and mode of action, most of the statements respecting it being empirical, and of little value.

TINCTURA ARNICÆ.—Tincture of Arnica.—Is used to paint over ecchymoses and sprains, or added to lotions; it is also given internally, in doses of ten to thirty drops, in nervous affections, and is particularly recommended on the Continent for diseases attended with debility.

Preparation.—Arnica root, in fine powder, ℥j.; rectified spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

TARAXACUM DENS LEONIS.—Dandelion.—Abounds in milky juice; it acquires its greatest bitterness during the summer months, whilst in winter and spring it has a sweetish taste, ascribed by Squire to the effects of frost on it. The juice when evaporated produces relatively the largest amount of extract in the autumn, and it appears to be in perfection about November. The fresh root is directed for medical use, gathered between September and February, from meadows and pastures; it is tap-shaped, smooth, and brown externally; when analyzed, it is found to contain gum, albumen, saccharine matter, resin, and a bitter crystalline substance, taraxacin, which tastes rather acrid; when kept for some time it affords mannite and lactic acid. As other roots, such as *Apargia hispida*, are sometimes substituted for dandelion by herb collectors, the following characters serve to distinguish them:—Genuine taraxacum "is not wrinkled or pale-coloured externally; its juice is not watery; and any adherent leaves are runcinate and quite smooth."

Botany.—Root spindle-shaped; juice milky; leaves radical, runcinate; scapes brittle, with a single head of yellow flowers, which expand in fine weather; involucre double, outer scales spreading, internal ones erect; receptacle naked; achenium oblong, ending in a long beak; pappus hairy, in many rows, radiating to form a light globe.

Varieties of secondary importance are described according to its habitat in meadows, dry places, or marshy localities.

Effects.—Taraxacum is a mild bitter and tonic, and considered to promote the action of the liver; it is given in chronic hepatic derangements; some forms of dyspepsia, with deficient biliary secretion, and after recovery from attacks of jaundice or gall stones; in large doses it is liable to cause purging, and also affect the kidneys, and an irritable condition of the stomach or bowels will contra-indicate its employment. The dried root, roasted and ground, and occasionally mixed with an equal proportion of coffee, is sold as DANDELION COFFEE for dyspeptic invalids; it possesses little or no medical properties.

Dose.—The expressed juice, recently obtained, is given in doses of f℥ss. to f℥ij., often combined with dilute nitric or nitro-muriatic acid, or with saline aperients; and the fresh leaves are eaten as a salad.

DECOCTUM TARAXACI.—**Decoction of Dandelion.**—This preparation possesses trifling effects. Its dose is f℥ss. to f℥ij.

Preparation.—The dried root of dandelion, sliced and bruised, ℥j.; distilled water, Ojss. Boil for ten minutes and strain; to measure Oj.

SUCCUS TARAXACI.—**Juice of Taraxacum.**—This is so easily obtained in a fresh state, that a formula requiring seven days for its preparation appears useless.

Dose.—f℥ss. to f℥j., once or twice daily.

Preparation.—Bruise the juice in a stone mortar; press out the juice; to every three measures add one of rectified spirit; set aside for seven days. Filter, and keep in a cool place.

EXTRACTUM TARAXACI.—**Extract of Dandelion.**—This extract should be bitter; by prolonged evaporation it becomes sweet and worthless. I believe aloes, in small quantity, or quassia, are used to adulterate it.

Dose.—Ten to sixty grains, added to the expressed juice or decoction.

Preparation.—Crush the fresh root, lb. iv.; press out the juice; let it deposit; heat the clear liquid to 212° for ten minutes; strain, and evaporate by a water bath at a heat not exceeding 160° to a proper consistence.

LACTUCARIUM.—Lettuce Opium.—Is obtained from the dried milky juice of the flowering stem of the wild or cultivated lettuce; it occurs in irregular masses of brownish colour, seldom larger than a small bean, having a bitter taste and weak opiate odour; its analysis shows the absence of morphia; it yields lactucin, a colourless neutral principle, with odorous matters, resins, and other vegetable substances. It is considered to be a mild anodyne, suitable for those cases where opium does not agree, and prescribed to relieve the cough in phthisis, and quiet nervous irritability; its powers are slight, and its action uncertain. It is excluded from the present Pharmacopœia.

Dose.—Five to ten grains, or upwards.

Lobeliaceæ.—Lactescent herbs or shrubs; leaves alternate, exstipulate; calyx five-partite, superior; corolla five cleft, irregular; stamens five, epigynous; anthers cohering; ovary inferior, one to three-celled; stigma fringed; fruit capsular; seeds numerous, albuminous.

LOBELIA INFLATA.—Indian Tobacco.—Is a common wild plant in the United States, and is cultivated by the "United Brethren," at Lebanon, New York, where they have extensive medical gardens; it is gathered at the end of August, when the capsules are formed, dried with great care on iron trays, and, before exportation, compressed into oblong packets, and wrapped in paper, each containing lb. ss. to lb. j. of the plant. The dried herb is pale green, has a faint nauseous smell, and tastes like tobacco; it affords lignine, gum, salts, and aromatic resin, lobelic acid which gives an olive precipitate with persalts of iron, and differs from tannin in not precipitating gelatine, and lobelina, an oily volatile alkaloid, closely resembling nicotine, but possessing less activity; it has a somewhat aromatic odour, and acrid taste, and is entirely decomposed by a boiling temperature.

Botany.—An annual, about one foot high, branched; stem angular; leaves scattered, serrate, and hairy; flowers in racemes; corolla blue, bilabiate; the two inferior anthers barbed at the point; capsule ovoid, two-celled, ten-angled, crowned with the calyx; seeds numerous, small, brown, and reticulated.

Effects.—Lobelia is chiefly prescribed as an expectorant, to relieve attacks of spasmodic asthma, and the dyspnœa which sometimes attends chronic bronchitis; in some of these cases it appears to operate as a direct sedative, giving rapid relief, without causing either nausea or vomiting. When large doses are employed, it usually sickens, and may be thus taken at the commencement of a paroxysm of asthma; but, like all other alleged specifics for this disease, though at first successful, it often fails completely afterwards. For hooping cough it has been tried with occasional benefit; and it is strongly recommended in America to induce relaxation of the uterus during labour, given in small repeated quantities.

Full doses of lobelia operate powerfully as a depressing emetic, and induce giddiness, depression of the strength, protracted nausea, purging, and sweating—effects which closely simulate those that result from common tobacco, which it further resembles in its unequal action on different individuals. When repeated too frequently, or given in an overdose, it will produce all the symptoms of a narcotico-acrid poison, with extreme prostration, anxiety, and ultimately convulsions. Such results are occasionally witnessed, both in England and America, from its unscrupulous use by quacks, who give it in teaspoonful doses; these, if not speedily ejected by vomiting, have proved fatal; and it would appear, from experiments made on animals, that death mainly results from the suspension of respiration; hence it is probable that it affects the respiratory nerves and medulla oblongata.

DOSE.—From half a grain to five grains are expectorant and nauseating; ten to twenty grains are emetic; it is seldom prescribed in powder.

TINCTURA LOBELIÆ.—TINCTURE OF LOBELIA.—Is given in doses of ten to thirty drops, for asthmatic attacks, and as a nauseating expectorant; larger doses are depressing and emetic.

PREPARATION.—Lobelia, dried and bruised, ℥ijss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

TINCTURA LOBELIÆ ETHEREA.—ETHEREAL TINCTURE OF LOBELIA.—Is useful in the same cases, and in similar doses, as the spirituous tincture.

PREPARATION.—Lobelia, dried and bruised, ℥ijss.; spirit of ether, Oj. Macerate for seven days; press, strain, and add sufficient spirit of ether to make Oj.

STYRACEÆ.—Trees, or shrubs; leaves alternate, exstipulate, often with stellate hairs; calyx free, persistent; corolla five to ten cleft; stamens united at the base, inserted into the bottom of corolla; ovary three to five-celled; ovules partly erect, in part pendulous; fruit succulent, often unilocular; seeds albuminous.

LIQUIDAMBAR ORIENTALE.—THE STORAX TREE.—Storax is obtained in Asia Minor, and imported through Trieste, from the Levant. The accounts which are given of the collection of this balsam vary; it appears to be got from the inner bark of the tree by expression, or, more probably, by boiling it with water. Several varieties of storax are described; those usually met in commerce are liquid, though tears of pure resin, and solid cakes are also occasionally procured. The common liquid storax is opaque, greyish, of the consistence of birdlime, having a fragrant odour, like a mixture of benzole and tonquin bean; it is imported in casks. A pellucid storax is more rare; it resembles Venice turpentine in appearance, and has an aromatic perfume of vanilla. The composition of storax must be uncertain, as so many substances are sold under this name; its principal components are styrol, cinnamic acid, and styracin. Styrol is a light volatile oil that resembles cinnamol, having a fragrant smell; if heated to 400°, it becomes solid, forming metastyrol, which can be redistilled at a high temperature, and reconverted into styrol; cinnamic acid has some resemblance to benzoic acid, but is distinguished by boiling with chromic acid, when it developes oil of bitter almonds; and styracin is a crystallizable solid, soluble in boiling alcohol.

Prepared storax is got by dissolving storax in rectified spirit, straining, and evaporating; it is a semitransparent brownish-yellow semifluid resin, of the consistence of thick honey, with strong fragrance and aromatic taste; heated in a test tube on the vapour bath, it should give off no moisture; boiled with solution of bichromate of potash and sulphuric acid, it evolves the odour of hydride of benzole, or bitter almond oil.

Botany.—A small tree; bark smooth; leaves villous beneath; flowers like the orange, in racemes; calyx downy, cup-shaped; corolla externally hoary; fruit the size of a cherry, downy, with one or two seeds.

Effects.—Like other balsams, it is useful in chronic bronchial affections; it acts as a detergent to foul ulcers in ointment, and is employed for making tincture of benzoin.

STYRAX BENZOIN.—The Benzoin Tree.—Benzoin, or Gum Benjamin, is a resinous exudation, obtained by incising the stems of the trees, when about six years old, at the origin of their leading branches, and collecting the exudation as it hardens. Each tree is reported to yield nearly three pounds' weight annually; that which exudes during the first three years is white, and most prized; afterwards its colour and value deteriorate. The best description of benzoin is imported from Siam; it seldom occurs in tears, more often consisting of irregular lumps or blocks, which consist of numerous imbedded white portions surrounded with a brown resinous matter, so that it presents a mottled appearance; that which is brought from Sumatra is in large rectangular blocks, covered with cotton cloth, and principally made up of brown resin, with small white portions intermixed; and inferior varieties consist exclusively of the dark-coloured resin. Benzoin is brittle, fragrant, especially when heated, and has a sweetish taste, becoming slightly acrid if chewed; it affords nine to fourteen per cent. of benzoic acid, mixed with different resins, one of which is soluble in ether, and a second in alcohol. Benzoin will dissolve in rectified spirit, or in solution of potash.

Botany.—A large tree, with downy branches; leaves oblong, pointed, downy beneath; flowers in compound axillary racemes; calyx campanulate, slightly five-toothed; corolla grey; petals five; stamens ten; ovary superior.

Effects.—Benzoin is usually prescribed internally in the form of tincture, as a stimulating expectorant for chronic catarrhs, and in old attacks of emphysema, with excessive secretion from the bronchial mucous membrane; its properties resemble those of myrrh, but it is considered less tonic. It is unsuited for inflammatory cases, and gastric irritation precludes its employment. The vapour of burning benzoin is also inhaled in chronic laryngeal and asthmatic affections—a simple tincture being brushed over brown paper previously soaked in nitre, and dried; it burns slowly when ignited.

TINCTURA BENZOINI COMPOSITA.—**Compound Tincture of Benzoin.**—As the resins will pecipitate when water is added, it is best prescribed in emulsion. It is sometimes used to dress foul ulcers and promote granulations, and occasionally applied on lint to check the hæmorrhage from recent wounds; this practice is not free from objection; it interferes with direct union of the surfaces, and is liable to excite inflammation. It is popularly termed Friar's balsam.

Dose.—fʒss. to f℥j., suspended in emulsion.

Preparation.—Macerate benzoin, in coarse powder, ℥ij.; prepared storax, ℥jss.; balsam of tolu, ℥ss.; Socotrine aloes, gr. clx., in rectified spirit, Oj., for seven days. Filter, and add sufficient rectified spirit to make Oj.

ACIDUM BENZOICUM.—**Benzoic Acid** ($HO, C_{14}H_5O_3$).—Forms light feathery white glistening needles, or scales, flexible, having a sour warm taste, and usually an aromatic odour, from the presence of traces of essential oil, acquired during sublimation; it has no smell when pure; it fuses readily, and sublimes at 293°; its vapours are acrid and irritating, burning when ignited with a smoky flame; it dissolves in five parts of boiling, or 250 parts of cold water; is readily soluble in alcohol, solutions of the caustic alkalies, and lime. This acid can be obtained by oxidizing oil of bitter almonds; hence the crystals which appear in the oil, when long kept, consist of benzoic acid. Another interesting source is hippuric acid, contained in the urine of herbivora, from which it is procured during putrefaction, or by boiling with hydrochloric acid; the hippuric acid, by combining with the elements of water, producing benzoic acid and glycocine, or gelatine sugar.

$HO, C_{18}H_8NO_5$ hippuric acid; $+ 2HO = HO, C_{14}H_5O_3$ benzoic acid; and $HO, C_4H_4NO_3$ glycocine.

For medical purposes it is got from benzoin, by the following process of Mohr's:—

Preparation.—Place benzoin, ℥iv., in a cylindrical pot of sheet iron, furnished with a flange at its mouth; and, having fitted the pot into a circular hole in a sheet of pasteboard, interpose between the pasteboard and the flange a collar of tow, so as to produce a nearly air-tight junction; let a cylinder of stiff paper, open at one end, eighteen inches high, and having a diameter at least twice that of the pot, be now inverted on the pasteboard, and secured to it by slips of paper and flour paste; pass two inches of the lower part of the pot through a hole in a plate of sheet tin, which is to be kept from contact with the pasteboard by the interposition of a few corks, and let a heat just sufficient to melt the benzoin (that of a gas lamp answers well) be applied, and continued for at least six hours, that benzoic acid may be sublimed. Let the product thus got, if not quite white, be pressed firmly between folds of blotting paper, and resublimed.

By roasting benzoin, about fourteen per cent. of acid is obtained; it frequently contains empyreumatic oil, from which it can be separated, as directed by blotting paper, and resubliming. The process is considered wasteful, much of the acid remaining in the charred residue. In practice it is got by boiling benzoin with lime and water, and precipitating the benzoic acid from the solution by dilute hydrochloric acid. If necessary, it can be purified by sublimation.

Purity.—It should sublime perfectly when heated, leaving no residue.

Effects.—When administered internally, it becomes absorbed, and, passing off through the kidneys as hippuric acid, can be collected in the urine, nearly the same weight being got as the benzoic acid that was taken; it deposits in rose-red acicular crystals, on acidulating the urine with one-twelfth of hydrochloric acid, and allowing it to rest for a few hours. As this change is produced by its uniting with nitrogenous elements, it has been proposed by Ure to administer benzoic acid in gouty and rheumatic affections, to eliminate uric acid, and prevent the deposition of lithates in the tissues. The researches of Dr. Garrod and others seem to show that the quantity of uric acid does not become materially altered; it has, however, been useful in treating phosphatic sediments, and is said to relieve nocturnal diuresis, and incontinence of urine. Benzoic acid is added to the camphorated tincture of opium, for some supposed expectorant properties; and it is occasionally employed in preparing ointments, or other greasy preparations, which it will prevent from becoming soon rancid.

Dose.—Ten to thirty grains, three or four times in the day; it is conveniently given dissolved in water, with four parts of phosphate of soda, or one and a half of borate of soda; or in the state of benzoate of ammonia.

COROLLIFLORAL EXOGENS.

Ericaceæ.—Shrubs, or small trees; leaves rigid, evergreen; no stipules; calyx free, four or five cleft; corolla hypogynous, four or five parted; stamens definite; anthers two-celled, often with bristle-like appendages, opening at the base or apex; ovary surrounded by a disk, becoming a berry or drupe, or half superior, becoming capsular; many-celled and seeded.

ARCTOSTAPHYLOS UVA URSI.—**The Bearberry**—Or *Uva ursi*, is a small trailing shrub which grows in dry heathy localities; the coriaceous obovate leaves are collected in autumn; they are dark green and shining above, lighter coloured and reticulated beneath; about three-fourths of an inch in length; having a bitter, astringent taste, and feeble hay-like odour when powdered; they contain thirty-four per cent. of tannin, with a small quantity of gallic acid, and also a peculiar bitter principle termed arbutin; this is described as crystallizing in thin colourless prisms, soluble in alcohol or water, and fusing when heated.

Botany.—A trailing shrub; leaves coriaceous, obovate; flowers in terminal clusters, each with three small bracts; corolla rose-coloured; stamens ten, inclosed; anthers compressed, opening at the apex, and laterally having two reflexed awns; ovary globose, surrounded by three scales; berry scarlet, with five single-seeded cells.

Adulterations.—Are seldom observed; the leaves of the whortleberry are sometimes substituted; they have a minutely toothed edge, and dotted under surface; and box leaves, if present, are easily recognised by their want of astringence.

Effects.—Uva ursi is employed in chronic affections of the urinary organs attended with mucous discharge, as an astringent, and to relieve irritation; its action is slow, and it requires to be persevered in for a considerable period to produce any benefit; its good effects appear altogether due to the large quantity of tannin which it contains. Dr. Prout usually gave it in combination with hyoscyamus, and considered it of much value; in large doses it is liable to derange the stomach and excite nausea. It is always used in infusion or decoction.

INFUSUM UVÆ URSI.—**Infusion of Bearberry.**—The average dose will be f℥ss. to f℥ij., taken twice or thrice daily; combined with alkalies, as solution of potash, or dilute mineral acids, according to the indications of the case; its action is essentially that of a simple astringent.

Preparation.—Uva ursi leaves, ℥ss.; boiling distilled water, Oss. Infuse in a covered vessel for two hours, and strain through calico.

Oleaceæ.—Trees, or shrubs; leaves opposite, simple, or pinnate; calyx persistent, sometimes absent; corolla four cleft or none; stamens usually two; ovary two-celled; ovules two, pendulous; fruit fleshy or dry, often one-seeded by abortion; seed albuminous; embryo straight.

OLEA EUROPEA.—The Olive Tree.—Is extensively cultivated in the south of Europe; it commences to bear fruit in its second year, is in full bearing at six years old, and continues to flourish for upwards of a century. There are several varieties, distinguished by the form of the leaves, and the shape and size of the fruit. The oil is obtained from the pericarp, or fleshy part of the ripe olives, by bruising them in a mill, and then submitting them to pressure; the product is liable to vary according to the condition of the fruit, and the precautions used during the process; the best and purest virgin oil flows from fruit picked before perfect maturity, and expressed without delay; a second quality is got from perfectly ripe olives; and an inferior kind, used for coarse purposes, from bruised fruit, thrown into heaps for some days, where it ferments, and by placing the marc in boiling water, and removing the oil as it rises to the surface. The oils imported from Provence, Florence, and Genoa, are of fine quality; the Spanish and Sicilian are less esteemed.

Oleum olivæ.—Olive oil is a pale yellow or greenish limpid oil, having a bland taste, and scarcely any odour; it dissolves in twice its volume of ether, and is only partially soluble in alcohol; at 38° it congeals, and separates into seventy-two parts of limpid oil or olein, and twenty-eight parts of stearin, a solid pearly fat; if exposed to the air, it is liable to become rancid, acquiring a disagreeable smell and taste, but does not solidify, and is therefore not a drying oil; its sp. gr. is about 0·915.

Botany.—A slow-growing tree, from fifteen to twenty feet high, with hard wood; leaves lanceolate, hoary beneath; racemes axillary, with numerous small whitish flowers; calyx four-toothed; corolla four-partite, spreading; stamens two; fruit a smooth oval drupe, greenish or violet-coloured, with a fleshy pericarp and very hard nut, one or two-seeded. The wild olive has spines, the cultivated varieties are unarmed.

Adulterations.—Cheaper oils are frequently mixed with it; their detection is difficult, though several tests have been recommended; the smell that is obtained by heating a few drops over a lamp is a useful guide. When recently prepared nitrate of mercury, got by dissolving four parts of the metal in eight and a half parts of strong nitric acid, is mixed with twelve times its weight of pure olive oil, they solidify in the course of a few hours; the presence of five per cent of foreign oil renders the consolidation slow, and less firm; and twelve per cent. is detected by floating on the surface.

Effects.—Olive oil is nutritious; and, given in doses of f℥ss. to f℥ij., is mildly aperient; it is occasionally prescribed when a laxative is required in irritable conditions of the bowels, and is frequently employed for purgative enemas. It is much used in pharmacy as a constituent of liniments, ointments, and plasters.

SAPO DURUS.—HARD SOAP.—Obtained by saponifying olive oil with soda, is directed for medical use; it should be specially prepared for this purpose, and has, when pure, a greyish-white colour; for the ordinary olive oil soap of commerce, termed Spanish or Castile soap, is mottled by oxide of iron, some sulphate of iron having been added to it when in a pasty state, which produces blue stains throughout its substance, that assume a red colour from peroxidizing on exposure to the air.

In the process of saponification, caustic alkali is mixed with the fatty constituents and a sufficient quantity of water, and boiled with constant agitation until a homogeneous fluid is formed, consisting of the fatty acids combined with the alkali, a quantity of glycerine being set free; to separate or curdle the soap, some common salt is then dissolved in the water, by which the greater portion of the water is removed, the curd floating on the saline solution, so that it can be collected, pressed, and dried. The varieties of soap that are made materially depend on the nature of the fats that are selected, and the alkaline bases with which these are combined: soda is used for making hard soaps, and the best curd soaps are got from tallow; for inferior descriptions, grease, palm oil, and cocoa nut oil, are extensively employed; common soft soaps are procured from oils deficient in solid substances, as fish oils, united with potásh, a little tallow being added to give them consistence.

SAPO MOLLIS.—SOFT SOAP.—Got by saponifying olive oil and potash, is also officinal; it is described as yellowish-white, inodorous, and of the consistence of thick honey; if of good quality, it should be entirely soluble in rectified spirit, not imparting an oily stain to paper; its special uses are not stated.

PURITY.—Hard soap should be entirely soluble in rectified spirit, and incapable of greasing paper; when dried, it ought to exhibit no saline efflorescence; and usually contains about twenty-one per cent. of water.

USES.—Soap is added to pill masses, to give them a proper consistence, and renders resinous purgatives more soluble, and milder in their action; it forms a good addition to purgative enemas, in cases of obstinate constipation depending on the lodgement of indurated fæcal masses; and a solution of soap in water is a ready and effectual antidote in poisoning with the mineral acids, which has the advantage of being easily obtained.

In liniments soap is much used for its lubricating properties; when the skin is unusually tender and predisposed to eruptions, the excess of alkali always present in common washing soap will cause irritation, and precludes its habitual employment.

EMPLASTRUM SAPONIS.—SOAP PLASTER.—Is applied on calico or leather, as a mechanical support to wounds and extensive ulcerations, and is in constant use for surgical strapping; it is also of service for defending tender surfaces from pressure; it should be freshly spread as required.

PREPARATION.—Litharge plaster, 2¼ pounds; melt with gentle heat; add hard soap, in powder, ℥vj.; resin, in powder, ℥j., first liquefied; and constantly stirring, evaporate to a proper consistence.

LINIMENTUM SAPONIS.—SOAP LINIMENT.—Is much used under the name of opodeldoc, as an embrocation to stiff joints, old sprains, and bruises. Complaints are made that the soap does not dissolve perfectly; it would be better to melt the soap in water, and the camphor and oil in rectified spirit, and afterwards mix the solutions.

PREPARATION.—Distilled water, f℥ij.; rectified spirit, f℥xviij.; mix, and add hard soap, ℥ijss.; English oil of rosemary, fʒiij.; camphor, 1¼ ounce. Digest, with occasional agitation, until all are dissolved, at a temperature below 70°.

FRAXINUS ORNUS.—THE FLOWERING ASH.—The manna of commerce is obtained from this tree and from *F: rotundifolia*; they are cultivated in plantations in Calabria and Sicily, and, according to Stettner, commence to yield manna after the eighth year, and continue for ten or twelve years, after which they are usually cut down, and young shoots allowed to grow up from the root. During the hot months the juice exudes spontaneously from the bark; but, as the exudation is slow, it is customary to facilitate its escape by making deep transverse incisions on one side of the trunk so soon as the leaves cease to be developed, which is in July and August; the cuts are about two inches long, made with a curved knife, commencing near the root, and are repeated daily in warm weather, one above the other, so that the opposite side of the stem is left untouched for next year's tapping. The finest FLAKE MANNA is obtained from the upper incisions; it consists of distinct pieces, sometimes six inches long and one or two broad, of pure white or pale yellowish colour, and furrowed on one side where they have adhered to the bark of the tree when drying. Manna has a faint, honey-like odour, and sweet taste, with a slight acridity; it is light, easily broken, and presents numerous small crystals through its substance, and dissolves in water or rectified spirit; this variety is imported, packed in deal boxes, frequently lined with tin plate. Sicilian, common, or FATTY MANNA, consists of small-sized viscid irregular-shaped fragments of dirty brownish yellow-colour, often mixed with impurities; its taste is less agreeable, and it has a stronger odour than fine manna; it is obtained in greatest quantity from the older trees, the juice of which is collected on opuntia leaves until sufficiently hard for removal.

Manna contains from thirty to forty per cent. of mannite, with uncrystallizable grape sugar, gum, water, and a very small quantity of disagreeable tasted resin. Mannite, or manna sugar, $C_6H_6O_4$, 2 HO, is extracted by boiling with alcohol, and deposits again in crystals on cooling; it may also be got from other vegetable sources, and from common sugar during the viscous fermentation of beet root juice; it is incapable of fermenting, and has no action on polarized light.

ADULTERATIONS.—Occasional attempts have been made to counterfeit manna with other sugars, but with little success, as they are easily detected.

BOTANY.—**F: ORNUS.**—A tree, twenty to twenty-five feet high; leaves pinnate, leaflets three or four pair, lanceolate, serrated at the apex; panicles large, many-flowered; flowers small, polygamous; corolla yellowish or greenish-white; fruit a samara, with two ovules, or by abortion one-seeded.

F: ROTUNDIFOLIA.—From sixteen to twenty feet high; leaflets two to four pair, ovate, obtusely serrated; petioles channelled; buds brown externally.

EFFECTS.—Fresh manna appears to be simply nutritious; by keeping, it becomes a gentle laxative, used to flavour draughts, or given to infants, dissolved in some aromatic water; in large doses it is considered liable to produce flatulence. Common manna is most active, though flake manna has a higher commercial value.

DOSE.—For the adult, ℥ss. to ℥ij., seldom used; for children, thirty grains to a quarter of an ounce.

ASCLEPIADACEÆ.—Lactescent, often twining plants, with entire, usually opposite leaves, and interpetiolar ciliæ; calyx five-divided; corolla five-lobed, imbricate; stamens five, filaments connate; pollen in waxy masses, cohering in pairs, attached to the stigma by five glands; fruit of two follicles, with numerous comose seeds.

HEMIDESMUS INDICUS.—**HEMIDESMUS.**—The root of this common Indian climbing shrub has been long used in Hindostan as a substitute for sarsaparilla, and is hence termed scented or Indian sarsaparilla; it is also often erroneously named *Smilax aspera;* it occurs in cylindrical tortuous pieces, from six to twelve inches long, marked with transverse annular cracks, and furrowed longitudinally; seldom branched; having a brownish-red corky bark, and ligneous centre; its odour is aromatic, resembling the tonquin bean or new mown hay, and its flavour is agreeable, and slightly bitter. Mr. Garden obtained from it a volatile crystalline substance, which Pereira called hemidesmic acid, having the smell and taste of the drug.

BOTANY.—Roots cylindical, tortuous; its cortex deeply furrowed in rings, around a woody meditullum; stems twining, woody and slender; leaves on short footstalks, bright green; flowers small, greenish-purple, in axillary cymes.

Effects.—In India it is employed instead of sarsaparilla, and considered a good alterative: we use it only for preparing an aromatic syrup, to flavour expectorant mixtures.

SYRUPUS HEMIDESMI.—**Syrup of Hemidesmus.**—Added to cough mixtures for its flavour.

Dose.—f℥ss. to f℥j. in an eight-ounce mixture.

Preparation.—Hemidesmus, bruised, ℥iv.; boiling distilled water, Oj.; infuse in a covered vessel for four hours; let the sediment subside, and dissolve in the clear liquid, with gentle heat, refined sugar, ℥xxviij. The product should weigh lb. ij. ℥x., sp. gr. 1·335. (To measure Oj.; f℥xjss.)

Loganiaceæ, or Strychneæ.—Shrubs, or trees, with opposite, entire, exstipulate leaves; calyx inferior, four or five parted; corolla four, five, or ten-cleft, convolute or valvate; stamens varying in number; fruit a two-celled capsule, with loose placentas, or a berry, or succulent, with one or two nucules; seeds usually peltate, albuminous.

STRYCHNOS NUX VOMICA.—**The Nux Vomica Tree.**—This tree is a native of the Indian forests and of Ceylon, where Sir J. E. Tennent states that its intensely poisonous seeds are eaten without injury by a bird; the wood and root are very bitter, and used in the East Indies for the cure of intermittents. The seeds are officinal; they are circular, nearly an inch in diameter, forming flattened disks about one-sixth of an inch in thickness, the dorsal surface being somewhat convex, the lower part flat or concave, marked with a central hilum, from which a line or raphé leads to a slightly elevated point on the edge of the seed, corresponding to the radicle of the embryo; externally they are shining and ash-grey coloured, thickly coated with very short silky hairs; within this outer covering, which is hard and fibrous, is a thin inner membrane, enveloping a white, hard, and horny albumen of intensely bitter taste, consisting of two portions, having on one side, between its divisions, the embryo, with its large, thin, ribbed cotyledons.

The bark of the nux vomica tree, when young, bears a close resemblance to angostura, for which it was mistaken many years since, and caused some serious accidents; as it becomes older, it loses this similarity, becoming covered with white or yellow excrescences, and when still older it acquires a rusty epidermal coating of cork-like growth; it is always easily recognised by its intense bitterness, devoid of the least aroma; and with nitric acid strikes a red colour on its inner surface, from the presence of brucia.

Strychnia seeds are difficult to pulverize unless previously steamed; or they will become disintegrated by maceration in hot water and dilute sulphuric acid; they contain 0·4 per cent. of strychnia, with rather more brucia, and some igasuria, united with lactic acid, and a peculiar vegetable acid.

BOTANY.—A moderate-sized tree; wood hard and bitter; leaves ovate, stalked, three to five-nerved, shining; flowers small, greenish-white, in terminal corymbs; corolla funnel-shaped; ovary two-celled; fruit covered with a fragile orange-coloured rind; pulp gelatinous, having many seeds attached to a central placenta.

EFFECTS.—Nux vomica administered in small doses is an excellent tonic in dyspepia, gastrodynia, and some forms of pyrosis depending on functional disorder of the stomach. I have found it of much service in treating the debility of advanced life, with feeble action of the heart, and slow pulse; it has also been used for hypochondriacal and neuralgic affections with considerable success. In epidemic dysentery it has gained some repute, particularly in Germany; and has likewise been prescribed, combined with purgatives, to relieve habitual constipation depending on want of action of the intestinal muscular fibres, or on spinal paralysis; and for excessive flatulent distention of the intestines.

If given in full repeated doses, it causes twitching of the voluntary muscles, and tonic muscular contraction, frequent spasms occurring like electric shocks by the slightest irritation, such as attempts at walking, gently tapping the limbs, or a sudden start; the pulse remains unaffected, and the mind seldom disturbed, though sometimes vertigo, dimness of vision, and sensations of tingling in the skin, are complained of. In over-doses rapid death will ensue, with symptoms resembling severe tetanus.

From its stimulant influence over the motor nerves nux vomica has been successfully employed in treating paralytic affections; when properly timed, it is very beneficial, though capable of causing great injury if injudiciously given. It is unsuited for recent attacks, or so long as there are evidences of advancing inflammation, or active disease in the brain, and is most useful in those cases that are unaccompanied by visible lesions of structure, such as the paralysis resulting from lead, and also for local paralytic affections, amaurosis, ptosis, and incontinence of urine from affections of the bladder. It has also been given, with occasional benefit, in the treatment of chorea, epileptic attacks, and amenorrhœa.

DOSE.—One-fourth of a grain to a grain, as a tonic; in paralysis, two or three grains, gradually increased; thirty grains have proved fatal.

ANTIDOTES.—Similar to strychnia.

TINCTURA NUCIS VOMICÆ.—TINCTURE OF NUX VOMICA.—Given internally in doses of twenty to thirty drops, gradually increased until some effect is produced; or employed externally as a liniment to paralyzed parts. Eleven minims contain the active portion of gr. j. of powdered nux vomica.

Preparation.—Nux vomica, ℥ij.; steam it till thoroughly softened; dry rapidly, and reduce to fine powder; macerate for forty-eight hours with rectified spirit, f℥xv., in a close vessel, and percolate, like tincture of aconite; to yield Oj.

EXTRACTUM NUCIS VOMICÆ.—Extract of Nux Vomica.—Good nux vomica will afford about one-thirteenth its weight of extract, which is liable to considerable variation in its strength.

Dose.—From half a grain to a grain or two, given thrice daily, until some evident effect on the system is observed.

Preparation.—Nux vomica, lb.j.; steam this until thoroughly softened; dry rapidly, and reduce to fine powder; exhaust it by boiling with successive portions of rectified spirit until the fluid comes off nearly free from bitterness; strain; distil off the spirit, and evaporate with a water bath to a proper consistence.

STRYCHNIA ($C_{42}H_{22}N_2O_4$).—This important alkaloid is present in several plants of the dangerous family of the "Strychneæ"—such as the seeds of *S: Ignatii*, or St. Ignatius' beans, which afford nearly one and a half per cent. of it; the *S: Tieute*, or Upas poison; and the *Nux vomica*, whence it is usually obtained, although they contain only about 0·4 per cent. Strychnia crystallizes in white anhydrous octohedra or square prisms, which do not fuse with heat; it is odourless, intensely bitter, insoluble in absolute alcohol or ether, but soluble in the essential oils, and in chloroform, which, if shaken with strychnia in an alkaline solution, will remove it from organic mixtures, and facilitate its detection; cold water dissolves only $\frac{1}{7000}$ of its weight, or gr. j. in f℥xiv., and if still more diluted the solution is distinctly bitter; when distilled with hydrate of potash, like quinia and cinchonia, it affords the oily base, quinolin; its salts are well defined, and have powerful basic properties.

Tests.—Pure strychnia with strong nitric acid forms the nitrate of nitro-strychnia, a substitution base of pale yellow colour; if brucia is present, the colour is bright orange-red.

With concentrated sulphuric acid and an oxidizing agent, as bichromate of potash (Otto), or peroxide of manganese (Merck), strychnia affords a deep violet colour, rapidly passing through red into yellow.

Dr. Marshall Hall proposed its action upon the lower animals as a delicate test; it excites violent tetanic spasms in frogs, or small fish, when immersed even in dilute solutions.

Brucia.—Is less active than strychnia, possessing only one-sixth its power; it crystallizes in transparent oblique rhombic prisms, and strikes a bright orange colour with nitric acid, emitting gases, and forming a nitro-substitution compound, named cacothelin, of feeble basic properties; it dissolves more freely in chloroform, and its neutral nitrate is so soluble, that strychnia can be separated from it by crystallizing first out of a mixed solution. Brucia is got in larger quantity than strychnia from nux vomica, and is also readily obtained from the nux vomica bark.

Igasuria.—A third alkaloid has been recently discovered, more soluble in water than either brucia or strychnia; it is supposed to be a compound substance, resulting from alteration in the brucia.

Preparation.—Nux vomica, lb. ij.; steam for two hours; chop or slice it; dry in hot air, or by a vapour bath, and immediately grind it in a coffee mill; digest with gentle heat for twelve hours with rectified spirit, Oij.; distilled water, Oj.; strain through linen, press strongly, and repeat the process twice. Distil off the spirit from the mixed fluid; evaporate the watery residue to about f℥xvj., and filter when cold; add acetate of lead, 180 grains, previously dissolved in distilled water, so long as it occasions any precipitate. Filter; wash the precipitate with cold water, f℥x.; add the washings to the filtrate; evaporate to f℥viij., and when cold add solution of ammonia in slight excess, stirring thoroughly; let the mixture stand at the ordinary temperature for twelve hours; collect the precipitate on a filter; wash with a few ounces of distilled water, and boil with successive portions of rectified spirit till the fluid scarcely tastes bitter; distil off most of the spirit; evaporate the residue to the bulk of about f℥ss., and set aside to cool; cautiously pour off the yellowish mother liquid (which contains the brucia) from the white crust of strychnia; throw the crust on a paper filter; wash with a mixture of rectified spirit two parts, water one part, till the washings cease to become red on adding nitric acid; finally, dissolve by boiling it in rectified spirit, f℥j., and set aside to crystallize; more crystals may be got from evaporating the mother liquor.

The seeds of nux vomica are steamed and dried, to assist in their disintegration, and then pulverized; the active principles are extracted by the rectified spirit and water, and the greater part of the spirit removed by distilling; the colouring matters are got rid of by precipitating with acetate of lead, and the vegetable alkaloids are thrown down by the addition of ammonia, which combines with the vegetable acids. On redissolving in rectified spirit, and crystallizing, the strychnia separates from the more soluble brucia, and is purified by washing with spirit and water, and finally recrystallized.

Purity.—Nitric acid does not produce a red colour with pure strychnia, if free from the presence of brucia, which is often found in commercial specimens; the absence of fixed impurities is shown by its leaving no ash after incineration.

Effects.—A single grain, or rather less, of this substance is sufficient to produce a fatal result; the symptoms that it causes bear a close resemblance to ordinary tetanus, from which they are chiefly distinguished by the rapidity of their progress; they have in many instances ensued within half an hour after the ingestion of the poison, and are seldom delayed longer than an hour and a half, whilst death has resulted in fourteen minutes after the first appearance of the symptoms. Loud and repeated screams and moanings commonly accompany its action, and the muscles of the hands and feet are observed to be early and severely affected; whilst in ordinary tetanus loud screaming is most unusual, and the smaller muscles are seldom obviously attacked. Death is considered to ensue from the convulsive fits exhausting the vital energy, or more rarely through asphyxia, caused by protracted muscular spasm; and possibly it is due primarily to the direct effects of the strychnia upon the nervous centres.

Administered medically in small repeated doses, it operates as a valuable tonic; but nux vomica, or its extract, are usually preferred for this purpose. When given in larger quantities, to bring the system under its specific influence, it is employed for treating paralytic affections; its operation is evinced by rigidity and involuntary startings of the muscles, which are excited by slight irritations, and in the majority of cases are most severe in the paralyzed limb; the explanations that have been offered of this fact do not appear altogether satisfactory. Dr. Todd supposed that it was caused by the strychnia being attracted in greater quantity to the seat of the nervous lesion in the brain, which remains still unproven. Dr. Marshall Hall considered it due to increased irritability of the paralyzed muscles; but this does not appear invariably to be the case, even where the strychnia acts powerfully upon them; and Segelas' opinion is, that the unaffected muscles, being under the control of the will, can better resist the spasmodic contractions. Strychnia is unsuited for exhibition in recent attacks of apoplexy, or so long as there is diseased action going on in the tissues of the brain, and is most successful when the paralysis is unaccompanied by structural lesions. In local affections—as amaurosis, ptosis, and the paralytic condition of the forearm that results from chronic lead poisoning; it is often applied endermically to the denuded surface of the cutis left after blistering; for this purpose, from a quarter to half a grain, in fine powder, is mixed with some inert substance, such as starch, and sprinkled over the part daily; should any unpleasant symptoms result, the strychnia is removed, and a little acetate of morphia applied; its use in this manner is sometimes liable to cause pain.

Antidotes.—Professor Haughton has suggested the use of tobacco, and its active principle, nicotine, from their physiological effects being opposed to those of strychnia; nicotine is so dangerous, that it appears unlikely to become generally used; an infusion of tobacco has the merit of being easily obtained, and from the rapid vomiting which follows its administration, is of service in getting rid of any of the poison still unabsorbed; tannin has also been used, and chloroform inhalation fully carried out appears beneficial.

Dose.—The one-sixteenth to one-eighth of a grain, taken thrice daily, until some obvious effect is produced; being intensely bitter, it is usually employed in the form of pill; if prescribed in mixture, it requires the addition of some acid to secure its solubility.

LIQUOR STRYCHNIÆ.—Solution of Strychnia.—A convenient formula for giving strychnia in a soluble form; like most of the officinal solutions, it contains four grains of the substance dissolved in f℥j.

Dose.—Ten to fifteen minims, taken thrice daily; ten minims are equivalent to one-twelfth of a grain of strychnia.

Preparation.—Mix hydrochloric acid, six minims; distilled water, fʒiv.; dissolve in this strychnia, in crystals, gr. iv., by the aid of heat; then add rectified spirit, f℥ij.; distilled water, fʒij.

Gentianeæ.—Herbs; leaves opposite, entire, often ribbed, no stipules; calyx permanent and inferior; corolla hypogynous, with twisted or plaited æstivation; stamens inserted on corolla; ovary one-celled, of two carpels, placed right and left of axis; styles two, at times united; capsule many-seeded, the margins of the valves inverted; embryo in the axis of fleshy albumen.

GENTIANA LUTEA.—The Gentian.—Gentian is collected on the mountains of central Europe, and imported in bales; it consists of branched or twisted pieces, varying from two to twelve inches long, and from half an inch to upwards of an inch in thickness, marked by close transverse rings, and furrowed along its length; the exterior is yellowish-brown; internally, it is paler, and spongy; its taste is very bitter, and it has a peculiar odour, which is stronger when fresh; it affords gentiopicrin, $C_{40}H_{30}O_{24}$, a bitter crystallizable principle; gentesin, a pale yellow crystalline tasteless substance; sugar, odorous volatile oil, pectin, and other vegetable matters.

Botany.—Stem erect, three feet high, hollow; leaves ovate, five to seven ribbed, the upper amplexicaul; flowers yellow, in an interrupted spike of whorls; calyx spathe-like; corolla rotate, four to six cleft; stigmas two; capsule one-celled; seeds roundish.

Adulterations.—The roots of several allied species are gathered; they are difficult to recognise, and have similar medical properties.

Effects.—Gentian is a tonic bitter; it improves the appetite and digestion, and is considered useful in treating dyspepsia, and gouty affections.

EXTRACTUM GENTIANÆ.—Extract of Gentian.—Gentian root will afford about half its weight of extract; it is chiefly used as as a vehicle for making pill masses.

Dose.—Five to twenty grains.

Preparation.—Sliced gentian, lb. j.; boiling distilled water, one gallon; macerate for two hours; boil for fifteen minutes; pour off the fluid; press and strain; then evaporate by a water bath to a proper consistence.

INFUSUM GENTIANÆ COMPOSITUM.—**Compound Infusion of Gentian.**—This contains a considerable proportion of spirit, and is therefore unsuited for children.

Dose.—From f℥ss. to f℥ij., thrice daily.

Preparation.—Sliced gentian, one quarter of an ounce; bruised bitter orange peel, coriander, of each, gr. xxx.; proof spirit, f℥ij.; place in a covered vessel; in two hours add cold distilled water, f℥viij.; and in two hours more strain through calico.

TINCTURA GENTIANÆ COMPOSITA. — **Compound Tincture of Gentian.**—A useful tonic, often added to bitter mixtures.

Dose.—fʒj. to fʒij.

Preparation.—Gentian, bruised, ℥jss.; bitter orange peel, cut small and bruised, three quarters of an ounce; cardamoms, bruised, one quarter of an ounce; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

OPHELIA CHIRATA.—**Chiretta.**—The chiretta plant grows on the mountains of Nepaul and northern India. The entire plant is collected when its capsules are forming, and, after being dried in the sun, is exported in bundles; the root is fibrous and small; the stem about three feet long, of the thickness of a straw, smooth, branched, with a soft yellowish pith, often having its sessile leaves still adherent; its taste is intensely bitter, with little odour. When analyzed, it affords a yellow bitter substance, with some resin and colouring matter, gum, salts, and woody fibre.

Botany.—An annual, three feet high, with straight round stem; leaves amplexicaul, lanceolate, five to seven-nerved; flowers in cymes; calyx four-cleft; corolla yellow, rotate; stamens four; capsules one-celled, two-valved; seeds numerous.

Effects.—Chiretta has long been used in India; its properties are those of a pure bitter; it appears to act slightly as an aperient, and bears some reputation for removing agues, and promoting hepatic secretion; it is also useful in gouty dyspepsia.

INFUSUM CHIRATÆ.—**Infusion of Chiretta.**—Is used in doses of f℥ss. to f℥ij., thrice daily.

Preparation.—Chiretta, bruised, one quarter of an ounce; distilled water, at 120°, f℥x. Infuse in a covered vessel for half an hour, and strain.

TINCTURA CHIRATÆ.—Tincture of Chiretta.—Usually added to the infusion, in doses of fʒj. to fʒij.

Preparation.—Chiretta, bruised, ℥ijss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

Convolvulaceæ.—Lactescent herbs and shrubs, usually twining; leaves alternate, exstipulate; flowers regular; calyx persistent, imbricate; corolla monopetalous, plaited; stamens five, alternate with corolline lobes; ovary free, two to four-celled; ovules one or two in each cell; capsules septifragal; seeds large, with mucilaginous albumen; embryo curved.

CONVOLVULUS SCAMMONIA.—Scammony.—The plant which produces scammony is a native of Syria and Asia Minor; its root is tap-shaped and perennial, sometimes acquiring the bulk of three inches in its diameter at the top; it is pale brownish outside, and white internally, having a faint odour, and abounds in milky juice when recent; this juice, procured by incision, and dried, constitutes scammony. It is collected by clearing away a portion of earth around the plant, and slicing off the top of the root obliquely, about two inches below where the stem appears; the exuding sap is gathered in small shells, or other convenient vessels, the produce rarely exceeding a quarter of an ounce from each plant. After twelve hours it is sufficiently dry for gathering, and seldom escapes adulteration before being sold, hence its quality and commercial value will vary greatly. Pure virgin scammony is imported in ash-grey rough irregular masses, friable, and breaking with a resinous shining fracture; its odour is compared to that of old cheese; if rubbed with water, it forms an emulsion, and its taste is slightly acrid. Inferior descriptions are mixed with chalk, so much as thirty-seven per cent. being added to the worst kinds. These are hard and heavy, the sp. gr. varying from 1·27 to 1·54; whilst genuine specimens seldom exceed 1·21; its colour is dull grey; and it effervesces freely with acids. Starch is also often present, and a gummy substance resembling tragacanth, some scammony containing starch alone, which is exceptional; this is recognised by moistening a small portion under the microscope, and adding dilute solution of iodine, which produces its blue reaction with the starch granules. Those adulterated scammonies are imported in flattened cakes of various sizes, or packed into cylindrical drums or boxes, or sometimes in lumps of irregular shape.

Dried scammony roots.—Imported from Smyrna; are officinal for preparing the resin.

Purity.—The amount of resin which is soluble in ether is a useful test of the value of scammony; it should take up from eighty to ninety per cent. of its weight, when of good quality.

Botany.—Roots perennial, tapering, one to three feet long, having an acrid milky juice; stems annual, and leaves on long petioles, arrow-shaped; peduncles solitary, axillary, three-flowered; corolla pale yellow, with purple stripes; ovary two-celled, four-seeded; capsules two-seeded.

Effects.—A powerful purgative, liable to gripe and irritate the bowels, usually added to other remedies, and valuable in treating children, from its slight taste and small dose, whenever an active cathartic is required; it should be used in fine powder.

Dose.—Five to ten grains of pure scammony are usually considered a full dose; for children, two to six grains are used, according to their age.

SCAMMONIÆ RESINA.—**Resin of Scammony.**—From the difficulty of obtaining unadulterated scammony, Mr. Wilkinson has patented a process for extracting the resinous portion of the dried roots, which has been adopted in the following officinal preparation; it occurs in dark brownish semitranslucent masses, which are brittle, and have a faint sweetish odour; it does not form an emulsion with water, as it contains no gum, and is distinguished from jalap resin by being soluble in ether; the composition of the resin, scammonin, is $C_{40}H_{33}O_{20}$.

Adulteration.—Should guaicum resin be mixed with it, its tincture would render the fresh cut surface of a potato blue.

Dose.—From four to six grains, used in the same manner as ordinary scammony, or made into an emulsion with milk.

Preparation.—The root, in coarse powder, ℥viij.; rectified spirit, f℥xvj.; macerate in a covered vessel, with gentle heat, for twenty-four hours; transfer to a percolator, and when the tincture ceases to pass, exhaust the root with successive portions of spirit; add to the tincture distilled water, f℥iv., and distil off the spirit by a water bath; remove the residue while hot to an open dish, and let it cool; pour off the fluid from the resin; wash it two or three times with hot water, and dry on a porcelain plate by a stove or water bath.

MISTURA SCAMMONII.—**Scammony Mixture.**—The milk suspends scammony, and effectually disguises its taste, so that it may be easily taken by children, in doses of fʒss. to f℥ij.

Preparation.—Triturate resin of scammony, gr. iv., milk f℥ij., gradually added until a uniform mixture is obtained.

PULVIS SCAMMONII COMPOSITUS.—**Compound Scammony Powder.**—A useless formula; the jalap can add little to its effects.

Dose.—Ten grains, which contain five grains of scammony.

Preparation.—Powder separately scammony, ℥iv.; jalap, ℥iij.; ginger, ℥j. Mix, and pass through a fine sieve.

CONFECTIO SCAMMONII.—Confection of Scammony.—Employed as an adjunct to purgative mixtures, to increase their effects; each gr. iij. are equivalent to gr. j. of scammony.

Dose.—From fifteen to twenty grains.

Preparation.—Rub scammony, or the resin, in fine powder, ʒiij.; ginger, in fine powder, ℥jss., with syrup, f℥iij.; clarified honey, ℥jss.; add oil of caraway, f℥j.; oil of cloves, fʒss. Mix.

EXOGONIUM PURGA.—Jalap.—Is collected in the woods of Mexico, around the town of Jalapa, from which it derives its name, situated at an elevation of 6000 feet above the sea level. The tubers are gathered during spring, and dried by exposure to the sun, or over fires, the larger ones being sliced or divided longitudinally, to favour their desiccation; they vary in bulk from the size of a closed hand to that of a small nut, and are covered with a thin dark brown rugous cuticle; their section is yellowish-grey, with a few darker concentric circles; they should be hard, and difficult to powder; their odour is disagreeable, and rather nauseous, and the taste is acrid and unpleasant. Jalap is liable to become worm-eaten; the insects, however, use only the starch, and leave the resin: such jalap is therefore better suited for making the extract; its active principle, or the resin of jalap, of which it yields from eight to fourteen per cent., is insoluble in turpentine, and becomes reddened by sulphuric acid; it can be separated into two substances, one of them acid and soluble in ether; the other, termed jalapin, is a glucoside, when decomposed affording glucose and a resinous acid; it consists of $C_{62}H_{52}O_{32}$, and appears to constitute the special purgative portion.

Botany.—Root stock tuberous, perennial, with pear-shaped tubers, and numerous long fibres; stem climbing, brown, and smooth; leaves cordate, on long foot stalks, the lower ones hastate; peduncles axillary, one to three-flowered, one opening at a time; corolla crimson, tube four times longer than the calyx; limb in five plaits; stamens, five, exserted; capsule two-celled, cells two-seeded.

Adulterations.—Fragments of the rhizome, termed in commerce jalap tops, are often mixed with the tubers; and the powder is liable to be adulterated with common sawdust; false jalaps are described, but are never met in our markets; they appear to be the produce of *Ipomœas*, or other convolulaceous plants.

Effects.—Jalap is an active purgative, producing watery discharges, and liable to cause nausea, griping, and sometimes vomiting; it stimulates the secretions and action of the intestines, and is less irritant than gamboge; similarly to all active cathartics, if given in over-doses, it may injure delicate persons, yet ill effects from it are of extreme rarity; it is frequently prescribed for cerebral affections, and other maladies that require hard purging, in powder or bolus, often combined with calomel, and is much used for a vermifuge and aperient in the diseases of children; for dropsical affections, when watery evacuations are required, the compound jalap powder is preferred.

Dose.—For adults, from fifteen to thirty grains, with which two to five grains of calomel may be given if required. For children three to ten grains, according to their age; it is sometimes added to gingerbread cakes, to disguise its taste.

JALAPÆ RESINA.—Resin of Jalap.—This represents the active principle. According to Brande, jalap will yield sixteen per cent. of resin: to prevent griping and irritation, it should be minutely subdivided with sugar, sulphate of potash, or other inert substances, or made into emulsion.

Dose.—From four to eight grains.

Preparation.—It is made from jalap, reduced to coarse powder, in the same manner as the resin got from scammony root.

EXTRACTUM JALAPÆ.—Extract of Jalap.—Jalap will afford more than half its weight of extract, in which the pure resin is diluted with inert constituents; as cold water is used in its preparation, it does not contain starch.

Dose.—About half that of jalap, given in pill, or dried and reduced to powder.

Preparation.—Macerate jalap, in coarse powder, lb. j., in rectified spirit, Oiv., for seven days; press out the tincture; filter, and distil off the spirit; macerate the residual jalap in distilled water, one gallon, for four hours; express; strain through flannel, and evaporate to a soft extract. Mix the two extracts, and evaporate at a heat not above 140° to a proper consistence.

PULVIS JALAPÆ COMPOSITUS.—Compound Jalap Powder.—A hydragogue purgative, used in dropsical affections, particularly for acute dropsy resulting from cold, or scarlatina.

Dose.—From thirty to ninety grains, taken in electuary or draught; and repeated, if necessary, every four hours, until it operates.

Preparation.—Jalap, ʒv.; acid tartrate of potash, ʒix.; ginger, ℥j. Mix the powders, and pass through a fine sieve.

TINCTURA JALAPÆ.—Tincture of Jalap.—Added to cathartic mixtures to increase their effect.

Dose.—fʒj. to fʒiv.

Preparation.—Jalap, in coarse powder, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, like tincture of aconite; to yield Oj.

Solanaceæ.—Herbs or shrubs; leaves alternate, sometimes collateral; flowers often from the axils, no bracts; calyx persistent, inferior; corolla usually regular, five-cleft, valvate; stamens on the corolla; anthers opening by slits or pores; ovary two-celled; stigma simple; fruit capsular or berried in two or four cells; seeds many; embryo usually curved, albumen fleshy.

CAPSICUM FASTIGIATUM.—Capsicum.—The ripe pods of Guinea or Cayenne pepper are obtained from the East and West Indies and the coast of Guinea; they are four to eight lines long, and two to three broad; smooth, shining, of orange-red colour, tasting intensely hot; the active portion is an acrid oil, *Capsicin*, which is extracted by alcohol; it has little odour, and when heated volatilizes with highly irritating vapours; by adding salt to the alcoholic tincture, and evaporating, "soluble cayenne" is obtained; used for culinary purposes.

Botany.—A shrubby, branching plant; leaves ovate, on long foot stalks; flowers small, white, axillary, and solitary; fruit a dry scarlet berry, with numerous flat seeds.

Effects.—Cayenne is a powerful stimulant; used as a condiment, and added to medical preparations for its carminative properties, and to disguise the taste of disagreeable drugs in mixtures such as turpentine; in lozenges and gargles it is a favourite domestic remedy for hoarseness and relaxed sore throat, and prescribed for cynanche maligna, and scarlatina anginosa, with great advantage, regulating the strength of the preparation according to the sensations of the patient. Applied externally, it is an energetic rubefacient; best used in cataplasm with linseed or mustard when rapid counter-irritation is required.

Dose.—One to five grains, in pill.

TINCTURA CAPSICI.—Tincture of Capsicum.—Added to stimulating and tonic mixtures; and to gargles for relaxed and ulcerated sore throat.

Dose.—Ten drops to thirty, properly diluted; from fʒi. to fʒiij. is sufficient for an eight-ounce gargle.

Preparation.—Capsicum, bruised, three-quarters of an ounce; rectified spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

SOLANUM DULCAMARA.—Dulcamara.—Woody nightshade, or bitter sweet, is a common climbing plant, growing in hedges and fields; it flowers in June, and its stems are gathered in autumn, when the leaves have fallen; they are about the thickness of quills, greyish-brown externally, white inside, with a spongy pith. When fresh their odour is nauseous, but faint, which is lost by drying; their taste is bitter, afterwards becoming sweetish; this is ascribed to a crystalline principle, picroglycion; they also afford an alkaloid, solania, which appears to have narcotic and acrid properties.

Botany.—Stem shrubby, twining in hedges; lower leaves cordate, the upper halbert-shaped, smooth; flowers in racemes, drooping; calyx permanent; corolla rotate, five-parted, purple, with two green spots at the base of each segment; anthers dehiscing by pores at the apex; berry scarlet, many-seeded.

Effects.—It is popularly considered alterative, and has some slight diaphoretic and diuretic action; its chief use is to exhibit more energetic remedies for chronic cutaneous eruptions. Dulcamara is always given in infusion.

INFUSUM DULCAMARÆ.—Infusion of Dulcamara.—Is prescribed in doses of f℥j. to f℥iv., thrice daily.

Preparation.—Dulcamara, bruised, ℥j.; boiling distilled water, f℥x. Infuse in a covered vessel for an hour, and strain.

Atropaceæ.—Allied to the Solanaceæ, but having an imbricate corolla; stamens five, one sometimes sterile, with anthers dehiscing longitudinally; properties narcotico-acrid.

HYOSCYAMUS NIGER.—Henbane.—The leaves and branches of indigenous biennial henbane, collected when the flowers are about two-thirds expanded, are officinal; it is usually cultivated for medical use, and flowers towards the end of May or in June; an annual variety flowering later, in July or August, is also grown; it is a weaker and less valuable plant; its stem is smaller and less branched, and its leaves not so deeply sinuated, hairy, or viscid; a sub-variety of this having its corolla yellow, without purple veins, is often met, and stated to grow wild in Surrey. The fresh gathered herb has a heavy fœtid odour, and slightly acrid taste, which nearly disappears on drying; it contains an alkaloid hyoscyamine that resembles atropine in properties.

Botany.—Biennial; in the first year arises a tuft of leaves, petiolated, woolly, with little odour or clamminess; next year another set of leaves spring, attached to a flower stem, one to three feet high, covered with viscid hairs; leaves sessile, amplexicaul, sharply lobed, downy, and viscid, of pale green colour; flowers nearly sessile, axillary, erect; calyx tubular, five-cleft; corolla funnel-shaped, unequally lobed, straw-coloured, with purple veins; capsule a pixidium, two-celled.

Adulterations.—The leaves of the first year have stalks, those of the second year are sessile; the former are sometimes improperly substituted for the mature henbane.

Effects.—This plant has seldom caused dangerous or poisonous symptoms; it may induce a state that resembles insanity, with phantasms, dilated pupil, and disordered vision; vomiting and diarrhœa are also observed to occur, or stupor, paralysis, and convulsions; all parts of the herb are injurious, but the seeds are considered most energetic. When prescribed in medical doses, it is anodyne, though far inferior to opium for relieving painful affections or inducing sleep; it also differs in its action upon the pupil, which it dilates, and is not liable to constipate or cause headach; but it requires to be given in tolerably full doses to produce any decided result. Dr. Garrod's observations have shown that caustic alkalies neutralize its effects on the eye, and destroy its anodyne properties; they exert a similar influence over the other solanaceous narcotics, stramonium and belladonna, and are therefore incompatible with them, whilst carbonated alkalies are unobjectionable. Henbane is employed for nervous irritability, restlessness, and want of sleep; in mania, and many painful and spasmodic affections, as neuralgia, gouty pains, chronic diseases of the urinary organs, asthmatic attacks, and nervous palpitation of the heart, and sometimes added to expectorant mixtures to relieve irritating cough. The extract is frequently combined with purgative pill masses, under the idea of preventing griping; and, given in full doses with camphor, is a favourite remedy for chordee. Like belladonna, it can be employed to dilate the pupil; but, being less powerful, is seldom used. Dissolved in stupes and poultices, it is applied to inflamed hæmorrhoids, painful and cancerous tumors, and irritable ulcers, or used in lotions to relieve intolerance of light in strumous ophthalmia.

Dose.—From two to twenty grains of the powder; this is seldom employed.

EXTRACTUM HYOSCYAMI.—**Extract of Hyoscyamus.**—This preparation is often injured from being carelessly made or kept; each cwt. of the recent herb will yield from lb. v. to lb. vj. of extract. It is added to purgative pill masses to prevent griping, and sometimes applied to painful and inflamed parts, glandular swellings, hæmorrhoids, &c., spread on linen, or made into a poultice; and, dissolved in lotion, is used to relieve the intolerance of light in strumous ophthalmia.

Dose.—From three to twenty grains.

Preparation.—The fresh leaves and branches, lb. 112; bruise in a stone mortar; express the juice; gradually heat to 130°, and separate the green colouring matter by a calico filter; heat the strained liquid to 200°, to coagulate the albumen, and again filter. Evaporate the fluid by a water bath to the consistence of thin syrup; add the colouring matter previously separated; stir assiduously, and evaporate at a heat not above 140°, to a proper consistence.

TINCTURA HYOSCYAMI.—Tincture of Hyoscyamus.—Its effects are slight and uncertain; it is prescribed as an anodyne in doses of fʒss. to fʒij., or more.

Preparation.—Hyoscyamus leaves, dried and bruised, ℥ijss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

ATROPA BELLADONNA.—Belladonna.—The dwale, or deadly nightshade, is indigenous, growing in hedges and waste grounds on calcareous soils; it is also cultivated for medical use. The leaves and fresh branches, gathered when the fruit has begun to form, are officinal, and the dried root imported from Germany; the leaves resemble those of lilac; they are disposed in pairs of unequal size; the flowers are drooping, of lurid purple, appearing in June; the berries, which ripen in September, are dark, shining, like black cherries, with a sweetish taste, and often cause serious accidents when eaten by children; they are distinguished by their persistent green calyx, and numerous small seeds; the root is perennial, one to two feet long, and from half an inch to two inches thick, wrinkled and branched, of brownish-white colour; they should be at least two or three years old before being collected for use. Belladonna contains an alkaloid, atropia, which is employed in medicine; and according to Brandes, two nitrogenous substances, pseudotoxia and phytocolla, that appear of little importance, with gum, starch, chlorophylle, and other ordinary vegetable constituents.

Botany.—Root perennial; stems annual, herbaceous; about three feet high; upper leaves on short footstalks, in pairs of unequal size; ovate acute; smooth, entire; flowers axillary, drooping; calyx persistent; corolla campanulate, greenish-purple towards its five-lobed border; berry violet-black, two-celled, many-seeded; with sweet pulp.

Effects.—All parts of this plant are poisonous, and accidents from it are not uncommon, though a fatal result seldom follows; soon after being taken, the throat and fauces feel dry and constricted; there is burning heat in the stomach, with thirst, and nausea or frequent attempts at vomiting; the patient complains of vertigo; his vision is confused; and there is an inability to perform the ordinary voluntary movements; extreme dilatation of the pupil is always noticed ; and delirium ensues, resembling the effects of intoxication, at times accompanied with phantasms, and varying in degree from mere wandering to furious mania; spasmodic affections that simulate chorea or tetanus may also occur; and an eruption of roseola, somewhat like scarlatina, is occasionally present; deep coma, prostration of the nervous energy, and insensibility, have preceded dissolution in those cases which ended fatally.

Internally it is prescribed as an anodyne and narcotic in many forms of neuralgic disease in which opiates fail to give relief, or are objectionable, as tic doloroux, dysmenorrhœa, painful spasm of the sphincter ani, affections of the neck of the bladder, spasmodic stricture, &c.; for hooping cough it has been strongly advised; it probably relieves bronchial spasm, and is sometimes of service in the advanced stages of the disease ; in tetanus it gives relief, at least in the more chronic cases; but a remedy for acute tetanus is yet to be discovered. When it is desirable to secure its full effect, the extract is usually administered in repeated doses, three or four times in the day, until it causes evident constitutional symptoms—such as dryness of the throat, dilated pupils, and some disorder of vision. Its alleged prophylactic action in preventing the contagion of scarlatina, which was originally advanced on insufficient grounds, has so often proved worthless, that its use in this manner may be considered obsolete.

Externally the extract is applied round the orbit, to dilate the pupil; the dilatation begins to be perceptible after about half an hour, and continues for a day or so; in iritis it prevents adhesions to the capsule of the lens, or assists in breaking them, if already formed, and greatly relieves the distressing nocturnal pain of this affection; in incipient cataract it often increases the distinctness of vision by enlarging the pupil, and some employ it previous to operating for extracting the lens, to secure full dilatation of the iris; the extract rubbed to the breast, or used as an ointment, is of service to arrest the secretion of milk after weaning, and has some influence in preventing threatened suppuration of the gland; it has also been found to relieve the distressing sickness of pregnancy, applied in plaster to the hypogastric region. When dissolved in water with five to ten grains of nitrate of silver, I have known the extract injected with much success into the bladder for the vesical irritability and pain that attends chronic cystitis; after remaining for a few minutes, it should be again drawn off through a catheter.

Antidotes.—The stomach should be emptied by emetics or the stomach pump, and afterwards purgatives administered; opium is recommended for its alleged antagonistic effects on the nervous system; but as most cases of poisoning by belladonna recover without its aid quite as rapidly as when it is given, its advantages cannot be great.

Dose.—Of the powder, one grain, thrice daily, gradually increased until the characteristic effects are observed; M. Runge several years ago pointed out, as Professor Garrod has done more recently, that caustic alkalies destroy the action of preparations of belladonna, and ought not to be prescribed with it.

EXTRACTUM BELLADONNÆ.—Extract of Belladonna.—When applied round the eye, the extract should be rubbed with water to the consistence of cream; if used to the nipple for preventing the secretion of milk, the quantity should not exceed thirty to sixty grains; for internal exhibition, the dose is one-fourth to one-half of a grain, gradually increased, if necessary, to gr. ij., taken three or four times in the day. One cwt. of recent belladonna will yield from lb. vj. to lb. viij. of extract.

Preparation.—This extract is obtained from the fresh leaves and young branches of belladonna, similar to the extract of hyoscyamus.

TINCTURA BELLADONNÆ.—Tincture of Belladonna.—This is seldom used; its average dose is from twenty to thirty drops, thrice in the day.

Preparation.—Dried belladonna leaves, in coarse powder, ℥j.; proof spirit, Oj., prepared by maceration and percolation, similar to tincture of aconite; to yield Oj.

LINIMENTUM BELLADONNÆ.—Liniment of Belladonna.—This concentrated preparation, of which each f℥j. is considered to represent an equal quantity of the root, is used for local rheumatic and neuralgic pains; it should not be employed with ammoniacal liniments, which render it inert; and there are good grounds for believing that it will be much more effectual if made with the recent root.

Preparation.—Belladonna root, in powder, ℥xx.; rectified spirit, f℥xxx.; moisten the root with a portion of the spirit; macerate for seven days, and then percolate into a receiver containing camphor, ℥j., until the product measures Oj.

Much more spirit will be required than the formula indicates, and there is considerable loss in its preparation.

EMPLASTRUM BELLADONNÆ.—Belladonna Plaster.—This should be spread with as little heat as possible, to avoid injuring its properties. It is used to relieve neuralgic pains, and for nervous palpitation and cardiac asthma, applied over the region of the heart; and as a resolvent to scrofulous and scirrhous tumors.

Preparation.—Soap plaster, resin plaster, of each, ℥jss.; melt with a steam or water bath; add extract of belladonna, ℥iij., and mix.

UNGUENTUM BELLADONNÆ.—OINTMENT OF BELLADONNA.—Applied to painful and inflamed parts, hæmorrhoids, &c.

PREPARATION.—Extract of belladonna, gr. lxxx.; rub smooth with a few drops of distilled water, and add prepared lard, ℥j. Mix.

ATROPIA ($C_{34}H_{23}NO_6$).—ATROPIA.—Crystallizes in colourless silky needles, which are odourless, and have an acrid bitter taste; it requires for solution 200 parts of cold water, but easily dissolves in acidulated water, rectified spirit, ether, or chloroform; the crystals fuse at 194°, and are sublimed and partially decomposed at 284°; its aqueous solution reacts alkaline, and gives a citron-yellow precipitate with chloride of gold.

PREPARATION.—Belladonna root recently dried, in coarse powder, lb. ij.; rectified spirit, Oiv.; macerate for twenty-four hours, frequently stirring; place in a displacement apparatus, and exhaust with more rectified spirit (Ovj.) by slow percolation; to the tincture placed in a bottle add slaked lime, ℥j., and shake several times; filter; add dilute sulphuric acid in very feeble excess, and filter again. Collect the spirit, and distil off three-fourths of it; add to the residue distilled water, f℥x., and evaporate at a gentle heat, but as rapidly as possible, until the liquid is reduced to one-third its volume, and no longer smells of alcohol; then let it cool; add very cautiously, with constant stirring, a solution of carbonate of potash, so as nearly to neutralize the acid, taking care not to use an excess; set to rest for six hours; filter, and add carbonate of potash until the liquid becomes decidedly alkaline; place it in a bottle with chloroform, f℥iij.; mix with repeated brisk agitation, and pour the mixed liquids into a funnel with a glass stopcock; when the chloroform subsides, draw it off by the stopcock, and distil it on a water bath from a retort, connected with a condenser. Dissolve the residue in warm rectified spirit; digest the solution with a little animal charcoal; filter, evaporate, and cool, till colourless crystals are obtained.

This process, devised by Mein, with slight modifications, consists in extracting atropia with spirit; precipitating the vegetable acid with hydrate of lime, and after its removal getting rid of any excess of lime by dilute sulphuric acid. The spirit is then distilled off, and replaced by water; on adding carbonate of potash, a yellowish resinous substance is eliminated which prevents the crystallization of the atropia; when this is separated, excess of potash deposits the atropia, which is subsequently dissolved out by chloroform, decolorized, and crystallized, from an alcoholic solution. From ℥xij. of the root Mein obtained gr. xx. of atropia.

EFFECTS.—Atropia is much employed for external use, from its rapid action, uniform strength, and cleanliness; its solution, dropped into the eye, will dilate the pupil within three to five minutes, and its effects continue for three or four days; Dr. Garrod asserts, that one-millionth of a grain, or even half that quantity, will induce this dilatation by its topical influence, whilst it requires one-thirtieth of a grain to act on the pupil if given internally. It can be applied in solution dropped into the eye, or more conveniently by inserting minute prepared disks of medicated gelatine beneath the lid, where they dissolve, and cause no permanent inconvenience.

Atropia is occasionally used in ointment, in the same manner as extract of belladonna, or may be administered internally, in doses of one-thirtieth of a grain, very gradually augmented, but requires extreme caution; for endermic use to recently blistered surfaces the dose is from one-thirtieth to one-tenth of a grain, mixed with sugar or starch.

LIQUOR ATROPIÆ.—Solution of Atropia.—Used for dropping into the eye, to dilate the pupil; a single drop acts rapidly. Much stronger solutions are employed by oculists; thus Sir W. Wilde applies either one, two, or three grains of atropia, dissolved in water, fʒj., with a minute quantity of dilute nitric acid and rectified spirit.

Preparation.—Rectified spirit, fʒj.; distilled water, fʒvij. Mix, and dissolve atropia in crystals, gr. iv.

UNGUENTUM ATROPIÆ.—Ointment of Atropia.—Used for rubbing over painful tumors, and neuralgic affections; about gr. xxx. may be applied at a time.

Preparation.—Atropia, gr. viij.; rectified spirit, fʒss.; dissolve, and add prepared lard, ℥j. Mix.

DATURA STRAMONIUM.—Stramonium.—Orthornapple, so termed from its large prickly capsule, is a native of Greece, introduced into England about 250 years since, and occasionally found growing in waste places and near old gardens; in North America, where it was also probably introduced, it has now become a common weed. Allied species, as *D: ferox* and *D: tatula*, are used in India to induce a state of intoxication and temporary delirium for criminal purposes; and in Mexico the *D: sanguinea* is employed for similar objects. When fresh, stramonium has a rank, unpleasant odour; its leaves and the ripe seeds derived from cultivated plants are officinal; the leaves should be gathered from the plant whilst flowering, they retain their nauseous bitter taste when dried; but usually the entire herb is sold, chopped into small pieces. The seeds are brownish-black, flat, and reniform, punctated externally; when bruised, smelling like the herb, and having a similar unpleasant taste; the active principle is termed daturia; it strongly dilates the pupil, and appears to be identical with hyoscyamia and atropia.

Botany.—An annual; stem branched and leafy; leaves large, dull green, unequal at the base, ovate, acutely sinuated and toothed; flowers axillary, white, sweet-scented, particularly at night; calyx tubular, five-angled, five-toothed, deciduous, leaving a mark around the base of ovary; corolla funnel-shaped, plicate; capsule two-celled, each parted by a false dissepiment, four-valved, prickly, the bulk of a walnut, with many black seeds.

Effects.—Stramonium is a powerful and dangerous narcotic; the symptoms which it causes are, flushing of the face, dryness and constriction of the throat, vertigo, widely dilated pupils, a fatuous state resembling intoxication, or furious delirium, and even sopor or convulsions; accidents have sometimes resulted from children eating the seeds, which are very active. When administered in medical doses, its effects resemble those of belladonna; it is chiefly used for spasmodic asthma, and to relieve painful nervous affections, as sciatica, dysmenorrhœa, and neuralgic diseases of the intestines, given in repeated small quantities until its narcotic influence is manifest; more often the herb is smoked, usually mixed with an equal quantity of tobacco, to allay the paroxysms of asthma, and promote expectoration; its over-use is liable to induce nausea, or temporary vertigo and drowsiness, and its indiscriminate employment is not free from risk; it may increase the dyspnœa, or impede the expectoration by its narcotic and sedative action, and must be used with discrimination by the aged, or when there is any obvious tendency to cerebral or cardiac disease, as fatal results have ensued from its incautious exhibition.

Dose.—Of the dried leaves, in powder, one to three grains, thrice daily; of the pulverized seeds, half a grain to a grain and a half. For *smoking*, fifteen to thirty grains will suffice; and two or three minutes should intervene between each inhalation of the smoke, carefully observing its effects.

Antidotes.—No direct antidote is known. The stomach should be discharged by stimulating emetics or the stomach pump, and the same treatment used as for poisoning with belladonna.

EXTRACTUM STRAMONII.—Extract of Stramonium.—The dose of this extract is from a quarter to half a grain, very gradually increased, and given, if necessary, every three or four hours, in asthma and other painful spasmodic affections.

Preparation.—Stramonium seeds, in coarse powder, lb. j.; pack in a percolator, and add proof spirit until the powder is exhausted. Distil off the spirit, and evaporate the extract to a proper consistence.

TINCTURA STRAMONII.—Tincture of Stramonium.

Dose.—Ten to thirty drops, given thrice in the day, or oftener.

Preparation.—Bruised stramonium seeds, ℥ijss.; proof spirit, Oj., prepared like tincture of aconite by maceration and percolation; to yield Oj.

NICOTIANA TABACUM.—Tobacco.—Several species of tobacco are described; that which is distinguished as Virginian tobacco is officinal; it is extensively cultivated in America, but its growth in this land is prevented by legal enactments. The crop requires constant attention to develope the leaves; they are gathered in August, and dried under sheds until fit for exportation; in this state they are deep brown and mottled, ovate, feeling clammy, with a well-known strong narcotic odour, and nauseous acrid taste. The manufactured leaves should be employed for medical use; during the process of drying and preparing them their composition appears to undergo some important changes, as they contain a liquid alkaloid, nicotia, which is not present in the recent herb; NICOTIA, $C_{10}H_7N$, exists in union with malic and citric acid; it is colourless, oily, and inflammable, with a powerful irritating odour of tobacco; boiling at 480°, but readily distilled with vapour of water; if exposed to the air, it oxidizes, becoming brown and solidifying. Virginian tobacco affords six to seven per cent. of nicotia, Havanah and Maryland about two per cent.; its salts are neutral, and difficult to crystallize; it is so poisonous, that a single drop has killed a large dog. Tobacco also contains a concrete volatile oil, nicotianin, which has the peculiar odour and taste of the leaf, and is procured by distillation; its ashes afford much saline matters, particularly potash salts; and during combustion a highly poisonous empyreumatic oil is produced, which may contain unaltered nicotia.

PREPARATION.—Nicotia is got by evaporating an aqueous infusion of the leaf to a syrupy consistence; adding two volumes of alcohol of sp. gr. 0·835, and decanting the upper stratum. This is concentrated, mixed with potash solution, and agitated with ether, which dissolves out the liberated nicotia, and some fatty matters. To purify the alkaloid, oxalic acid is added to the ethereal solution, and the oxalate of nicotia precipitates as a syrupy layer; this is washed with pure ether, and the nicotia separated by more potash solution and ether. After being exposed to a heat of 284° for twenty-four hours in hydrogen, to expel any ether or ammonia, it is finally distilled at 356° in hydrogen gas, and comes over pure.

BOTANY.—Stem three to six feet high, branched, viscid; leaves sessile, oblong lanceolate, slightly hairy; flowers in terminal panicles, with bracts; calyx tubular, hairy; corolla rose-coloured, funnel-shaped, throat inflated, five-cleft; capsule two-celled, two-valved, opening across the top; seeds numerous.

EFFECTS.—When tobacco is taken internally in large doses, it causes nausea, vomiting, relaxation of the muscles, and extreme prostration of strength, with vertigo, cold sweats, pallor, and feeble, fluttering pulse; affecting the heart, according to Brodie, through the medium of the nervous system: excessive depression and insensibility may result from its use; and death has followed within three quarters of an hour, or less, after taking it. If applied to extensive ulcerated surfaces, its absorption may induce similar symptoms; and the smoking of it in excess by those unaccustomed to its effects is not free from danger. Its principal medical use is to relax muscular spasm; the infusion is occasionally administered in enema, or tobacco smoke injected into the rectum, for colic, obstinate constipation, and recent strangulation of the intestines from hernia. Abercrombie advised it for cases of ileus; and it has also been employed for spasmodic stricture, and frequently recommended in the treatment of tetanus. Professor Haughton has ably advocated the introduction of nicotia into medical practice, particularly for the convulsions caused by poisoning with strychnia, relying on the direct antagonistic effects it produces on the system; it has also been tried in some cases of tetanus, with the result at least of controlling the spasms; it is given in doses of half a drop to a drop, repeated every hour or so, until its full depressing influence is produced. Tobacco is little used internally, though formerly considered diuretic and anthelmintic; applied in stupes, it relieves severe attacks of colic, and has been found of service in aggravated hysterical convulsions.

ANTIDOTES.—The poison should be evacuated as soon as possible, and stimulants, ammonia, &c., freely used; the vegetable astringents are considered of service, tannin forming a precipitate with nicotia; in severe cases artificial respiration should be tried, and galvanism applied over the heart.

ENEMA TABACI.—ENEMA OF TOBACCO.—This must be used with much care, and not repeated too often, at least allowing an hour to intervene; gr. xxx. of tobacco exhibited in infusion have proved fatal.

PREPARATION.—Leaf tobacco, gr. xx.; boiling water, f℥viij. Infuse for half an hour, and strain.

SCROPHULARINÆ.—Herbs, or shrubs; leaves opposite or alternate, exstipulate; calyx tubular, four or five-cleft, permanent; corolla irregular, imbricate; stamens didynamous, or two; ovary bilocular; carpels anterior and posterior; fruit two-celled, capsular or baccate; seeds albuminous.

DIGITALIS PURPUREA.—FOXGLOVE.—Or fairy finger, is a handsome wild plant, growing on dry banks and hedges, where there is no limestone subsoil; as the herb is biennial, its leaves should be gathered in the second year, when the flowers are two-thirds expanded, and dried rapidly in stoves or a warm room; the midrib and leafstalk ought to be removed, having little activity; and the leaves are best preserved in coarse powder within tin vessels, and collected fresh each year, as their properties become impaired if long kept; they are dull green, have little odour, and a nauseous bitter taste. The active constituent, DIGITALIN, is officinal; this substance is termed DIGITALINE by Homolle and Quevenne, who also describe three peculiar neutral bodies which they have obtained, and different organic acids, besides the usual vegetable matters, as starch, sugar, chlorophylle, &c., and some inorganic salts.

Botany.—Biennial, in the first year having a tuft of radical leaves, next year forming a stem, one to five feet high, leafy, slightly angled, and downy; leaves ovate lanceolate, crenate, downy beneath; flowers in a unilateral raceme; calyx five-parted; corolla purple, with white eyedots, and hairy within, campanulate, inflated below; stamens didynamous; fruit capsular.

Adulterations.—The cream-coloured foxglove grown in gardens is not used; verbascum leaves are distinguished by being downy on both surfaces, and those of *Scrofularia nodosa* are smooth; they are occasionally employed in mistake for foxglove.

Effects.—Over-doses of digitalis will produce symptoms that closely resemble the effects of tobacco, as nausea and vomiting, clammy perspirations, slow and irregular action of the heart, and extreme prostration, with contracted pupils; and even lethargy, convulsions, and syncope may ensue; these are best treated by the free use of stimulants, and of emetics if necessary. When digitalis is administered in repeated small quantities it is liable, after a time, to induce sudden depression of the circulation, vertigo, nausea, and fainting, which is not without danger, as in some instances death has resulted from its incautious employment; this is ascribed to its cumulative effects on the system, and is best guarded against by discontinuing its use so soon as the pulse falls in its frequency much below the normal standard or begins to intermit; still it is an undoubted fact that amongst the Irish peasantry a strong decoction composed of a handful of fresh digitalis leaves boiled with porter is a popular remedy for epilepsy; and further, the exhibition of large quantities of the tincture, as f℥ss. to f℥j., has been strongly advised for some years past for medical use, chiefly in the treatment of phthisis, to lessen the rapidity of the circulation; to subdue acute inflammatory diseases, or after surgical operations, for controlling the secondary fever; and particularly in cases of uncomplicated attacks of delirium tremens; though there are good reasons for believing that, whilst these doses are not so invariably dangerous as they were once supposed, they are not always so innocuous as their advocates think.

Digitalis was introduced into practice by Dr. Withering as a diuretic; its action on the kidneys is greatly influenced by combining it with other diuretic remedies, and its effects are most obvious in anasarca depending on disease of the heart or kidneys, occurring in individuals of lax habit, with pale surface and feeble circulation; it is often prescribed with squill and mercurials, or added to decoction of broom and acetate of potash. Its sedative influence over the heart has led to its use in cardiac diseases; it is of service when there is obstruction of the mitral or aortic orifices; for by lessening the number, and increasing the duration of the muscular contractions, it enables more blood to pass slowly through the strictured part than the violent irregular pulsations of the heart can effect, and thus, equalizing the balance between the venous and arterial systems, it relieves dyspnœa and palpitation; its action once induced is very permanent, lasting for weeks after the remedy is discontinued; but stimulants, sudden agitation, or anything that accelerates the heart's impulses, will undo all the benefit already obtained. In regurgitant cardiac affections the excessive and laboured action of the heart can be considered only an imperfect effort to compensate for the diminished supply of blood which is sent to the brain and arteries, and digitalis is of little use, if not positively injurious; it is also of slight value in treating functional palpitations, but proves of great advantage in hæmoptysis depending on cardiac disease, and has sometimes been given in internal aneurisms to favour the formation of coagula within the sac.

In epileptic attacks not depending on organic causes, Dr. Corrigan has used foxglove with much success; he commences by employing about f℥j. of the infusion every night for a week, gradually increasing it until it causes nausea, intermission of the pulse, or other symptoms of its constitutional action; the dose is then diminished, and persevered in for at least two or three months. Digitalis has also been recommended for treating obstinate cases of spermatorrhœa; and, applied externally over the abdomen as a stupe, its infusion will sometimes operate as a speedy and effectual diuretic when internal remedies have failed.

Dose.—From half a grain to two grains of the powder, taken three or four times in the day.

TINCTURA DIGITALIS.—Tincture of Digitalis.—The dried leaves appear to be intended for this preparation, though not specified.

Dose.—Ten to thirty drops, three or four times a day, cautiously increased or persevered in until some effect is observed; as already mentioned, f℥ss. to f℥j. has been given at a time, but the results are not encouraging.

Preparation.—Digitalis, bruised, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, like tincture of aconite; to yield Oj.

INFUSUM DIGITALIS.—Infusion of Digitalis.—When well made, this is an effectual mode of administering foxglove.

Dose.—f℥ss. to f℥j., taken three or four times in the day.

Preparation.—Digitalis, dried, gr. xxx.; boiling distilled water, f℥x. Infuse in a covered vessel for one hour, and strain.

DIGITALINUM.—Digitalin.—No formula is given for this substance, which is usually stated to consist of $C_{22}H_{19}O_9$; it is composed of porous mamillated masses, or small scales, white, inodorous, powerfully irritating the nostrils, soluble in spirit, but almost insoluble in water and ether; intensely bitter, one grain being perceptible in twenty-one pints of water, by its taste; it dissolves in acids, though not forming neutral compounds with them; in hydrochloric acid its solution is yellow, rapidly becoming green; if burned with free access of air, it leaves no residue.

Preparation.—Digitalis, in powder, ℥xl.; rectified spirit, two gallons; digest at a heat of 120°, for six hours; separate the tincture by filtration and subsequent expression; distil off the spirit; treat the extract with distilled water, f℥v., acidulated with acetic acid, f℥ss.; digest with a quarter of an ounce of purified animal charcoal. Filter, and dilute the filtrate with distilled water to Oj.; now add solution of ammonia nearly to neutralization, and afterwards tannic acid, 160 grains, dissolved in distilled water, f℥iij. Wash the precipitate thus obtained with a little water; mix it with a small quantity of rectified spirit, and carefully rub in a mortar with litharge, in fine powder, a quarter of an ounce; place in a flask; add rectified spirit, f℥iv.; raise the temperature to 160°, and maintain it for about an hour; add purified animal charcoal, a quarter of an ounce; filter; remove the spirit by distillation; lastly, wash the residue repeatedly with pure ether.

This is Homolle's process, modified by Henry. The alcoholic extract of the plant, acted on by weak acetic acid, is decolorized with the charcoal, nearly neutralized by ammonia, and on adding tannin gives a precipitate of tannate of digitalin. This is mixed with litharge to separate the tannin, and affords free digitalin, soluble in rectified spirit; after again decolorizing it, all traces of spirit are expelled, and the residue washed repeatedly with pure ether, which dissolves the digitalose and other principles, leaving the digitalin perfectly insoluble.

Purity.—The test which is given for digitalin is, that with hydrochloric acid it dissolves of faint yellow colour, rapidly becoming green, and should burn perfectly away in a current of air; but these are scarcely sufficient to determine its purity, and much of that sold is worthless. According to Homolle, its bitterness should be such that 0·77 grain requires about twenty-one pints of water to render its taste imperceptible.

Effects.—Digitalin* is assumed to be about a hundred times more active than the dried leaf; its dose will therefore range from $\frac{1}{30}$th to $\frac{1}{30}$th of a grain; but the difficulty of regulating such minute quantities is extreme, and must limit its use, even if its purity could be depended on; nor does it appear to present any important advantage over the powder or infusion, to compensate for the risk of employing it.

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* This is termed Digitaline by Homolle, and the change of name is to be regretted, as he terms another substance Digitalin. The four neutral bodies which he describes, are—

Digitaline.—Non-crystalline, intensely bitter, little soluble in ether.

Digitalose.—White, crystalline, insipid, and soluble in ether.

Digitalin.—White, pulverulent, nearly insipid, insoluble in ether, and precipitated by potash from an alcoholic solution.

Digitalide.—Like the last in properties, but forming white scales.

Labiatæ.—Herbs, with tetragonal stems, and opposite exstipulate leaves; often aromatic; flowers in axillary cymes; calyx tubular, persistent; corolla bilabiate; stamens didynamous, or two; ovary four-lobed; achenes one to four; seeds with little or no albumen.

LAVANDULA VERA.—Lavender.—Is a native of southern Europe, successfully cultivated in Surrey for medical use. The flowering spikes are collected in summer, and distilled with water, to obtain the essential oil, oleum lavandulæ; lb. 70 of flowers will afford about Oj. of oil, which is pale yellow, fragrant, tasting warm and aromatic; its sp. gr. varies from 0·877 to 0·905; when long kept, it deposits a large proportion of laurel camphor. The oil which is procured from the French lavender, *L: latifolia*, termed oil of spike, is much inferior, and differs little from turpentine; its chief use is for making varnishes, and for porcelain painting. The English oil is highly valued for perfumery; though stimulant, it is seldom employed internally.

Botany.—A shrub; leaves linear or lanceolate, hoary when young; flowers in interrupted spikes, purplish-grey; calyx tubular, five-toothed, with thirteen to fifteen ribs; corolla, upper lip two-lobed, lower three-lobed; stamens didynamous; anthers reniform.

TINCTURA LAVANDULÆ COMPOSITA.—Compound Tincture of Lavender.—Generally termed lavender drops, is used to relieve nausea, flatulence, and hysterical affections.

Dose.—fʒss. to fʒij., in water, or dropped on white sugar.

Preparation.—Cinnamon, nutmeg, of each, bruised, 150 grains; red sandal wood, 300 grains; rectified spirit, Oij.; macerate for seven days; press and strain; dissolve English oil of lavender, fʒjss.; English oil of rosemary, ten minims, and add rectified spirit to make Oij.

SPIRITUS LAVANDULÆ.—Spirit of Lavender.—Of little use, except as a pleasing perfume.

Preparation.—English oil of lavender, f℥j.; rectified spirit, f℥ix. Dissolve.

MENTHA VIRIDIS.—Spearmint.—An indigenous perennial herb, found, apparently wild, in marshy localities, and cultivated in the Surrey gardens for medical use; it is collected in dry weather, when in full flower; its odour is strong and aromatic; it is used for distilling the oil, oleum menthæ viridis. This is pale yellow, becoming reddish through age; sp. gr. 0·914; it boils at 320°; and consists, according to Kane, of $C_{30}H_{28}O$; like other mints, it produces a sensation of coldness in the mouth; it dissolves in rectified spirit.

It is used to relieve nausea, and as a carminative, in doses of gtt. ij. to gtt. vi., dropped on sugar, or suspended in water.

Botany.—Root creeping, stem smooth, erect; leaves sessile, unequally serrated; those beneath the flowers resemble bracts; spike cylindrical, loose, in whorls; calyx five-toothed; corolla, tube enclosed, limb campanulate, four-cleft; stamens four, equal; anthers with two parallel cells; fruit dry.

AQUA MENTHÆ VIRIDIS.—Spearmint Water.—Used as an aromatic vehicle for exhibiting other medicines, in doses of f℥ss. to f℥ij.

Preparation.—English oil of spearmint, fʒiss.; water, a gallon and a half. Distil one gallon.

MENTHA PIPERITA.—Peppermint.—Though asserted to grow in some marshy localities, it cannot be properly termed an indigenous plant; it is cultivated in Surrey with such success, that English oil of peppermint possesses the finest flavour, and commands the highest price in commerce. Oleum menthæ piperitæ is obtained by collecting the herb when in full flower, and distilling it with water; the oil that separates is gathered for use; it is colourless, or pale greenish; highly fragrant and pungent, having a powerful odour of the plant; a solid camphor, $C_{20}H_{18}, 2HO$, and a liquid oil, can be separated from it; and by distilling with anhydrous phosphoric acid, a hydrocarbon is got, termed menthene, $C_{20}H_{18}$.

Effects.—Oil of peppermint is used in rhubarb pill, and occasionally given dropped on sugar as a carminative, in doses of gtt. ij. to gtt. vj.

Botany.—A perennial plant, with creeping root; stems smooth; leaves stalked, ovate lanceolate, serrated; flowers in lax spikes, the upper whorls forming a short obtuse spike; calyx tubular; flowering in August and September.

SPIRITUS MENTHÆ PIPERITÆ.—Spirit of Peppermint.—Employed as a carminative, and for flavouring, in doses of gtt. v. to gtt. xij.

Preparation.—English oil of peppermint, f℥j.; rectified spirit, f℥ix. Dissolve.

AQUA MENTHÆ PIPERITÆ.—Peppermint Water.—Chiefly used as a vehicle, in doses of f℥ss. to f℥ij.

Preparation.—English oil of peppermint, fʒjss.; water, one gallon and a half. Distil one gallon.

MENTHA PULEGIUM.—PENNYROYAL.—Is a widely distributed European plant, growing on moist meadows and near brooks, and cultivated in England for medical purposes; like other mints, it should be gathered in full flower; its taste is distinctive, but its properties are similar to peppermint; it is considered to have some special influence over the uterus, and is popularly used for hysterical affections, and for the after pains of labour. OLEUM PULEGII is not officinal; its sp. gr. is 0·925; according to Kane, this essential oil consists of $C_{10}H_8O$; it may be given in doses of gtt. ij. to gtt. vj.

BOTANY.—A perennial herb; roots creeping; leaves small, ovate, with pellucid dots, and slightly hairy; whorls all remote, globose, many-flowered; calyx hispid, bilabiate.

ROSMARINUS OFFICINALIS.—ROSEMARY.—Is cultivated for preparing the oil, which is got from its flowering tops; it is a native of southern Europe; the flowering tops have a strong peculiar odour, and warm bitter taste; OLEUM ROSMARINI, $C_{45}H_{38}O_2$, has sp. gr. 0·89; it boils about 365°. Its properties are similar to other essential oils; it is used chiefly for preparing liniments and hair washes.

BOTANY.—A leafy shrub; leaves sessile, narrow, with revolute edges, hoary beneath; flowers few, in short opposite spikes; corolla shorter than the purplish calyx; petals lavender-coloured.

SPIRITUS ROSMARINI.—SPIRIT OF ROSEMARY.—Added to lotions and other external applications for its aroma; seldom employed internally.

PREPARATION.—English oil of rosemary, f℥j.; rectified spirit, f℥ix. Dissolve.

MONOCHLAMYDEOUS EXOGENS.

POLYGONACEÆ.—Herbs; leaves alternate; stipules ochreate; flowers occasionally unisexual; perianth often coloured; stamens definite; ovary of three carpels, forming a triangular, one-celled, one-seeded nut; embryo in mealy albumen.

RHEUM.—RHUBARB.—Is obtained in the central districts of Asia, from Tartary and Tibet; its sources are still not fully determined, several species probably contributing to produce the roots of commerce, some of them being similar to those that are commonly cultivated in our gardens. The following are the principal trade varieties:—

CHINESE OR INDIAN RHUBARB.—This consists of roundish and cylindrical masses, or angular fragments, frequently perforated by holes, which may contain portions of cord used for drying the roots. The finest descriptions known in English commerce, as TURKEY RHUBARB, is composed of carefully selected and pared pieces of the best quality; of a bright yellow colour, sound, and hard, which have been sliced, and present angular edges and flat surfaces, the cortex and all decayed parts being perfectly removed; in some of the pieces holes are noticed that do not extend completely through, and that were made to examine the condition of the root internally. It has a bitter, rather astringent taste, and feels very gritty in the mouth, abounding in raphides or crystals of oxalate of lime, of which it may contain from thirty to forty per cent.; its substance is finely veined with reddish and white streaks, and its powder has a fine yellow hue. An extensive trade is carried on by the Russian Government through Bucharian traders, who purchase this rhubarb from the Chinese at Kiachta, and transmit the selected pieces packed in chests to Europe; hence it is sometimes termed Bucharian and Russian crown rhubarb.

The ordinary CHINESE or INDIAN RHUBARB, is brought by sea from Indian or Chinese ports; it is either "trimmed" in imitation of the Russian rhubarb, or has its cortical part incompletely scraped off, not sliced; the best pieces are heavy and compact, of rather coarse fibrous quality, free from decay or marks of insects; they are gritty when chewed, and taste peculiarly bitterish and aromatic; the inferior portions are dark-coloured or soft, and decayed internally; and as both descriptions are mixed in the chests, it is handpicked before being sold, to separate the finer lumps; when reduced to powder it has a darkish yellow colour.

ENGLISH RHUBARB has been cultivated for nearly a century in Oxfordshire; it is altogether the produce of *Rheum rhaponticum*, and obtained from roots of three or four years old, which are dug in autumn, and dried at first in the air, and afterwards with artificial heat; the main roots are trimmed to resemble Turkey rhubarb, and the smaller pieces are sold in slender sticks; it is light, soft, and spongy, with a peculiar reddish or pink hue, but streaked with white like other rhubarbs; its taste is astringent and mucilaginous, and only slightly gritty, containing little oxalate of lime; its powder, which is bright yellow, is used for adulterating the more expensive kinds, and when kept soon becomes pasty by attracting moisture. Its medical properties are slight.

Rhubarb has been frequently analyzed. According to Schlossberger and Doepping, it contains rhein, or chrysophanic acid, which can be got in golden-yellow crystals of metallic lustre, free from taste and odour, sparingly soluble in water, and forming with alkalies a fine red solution; three resins (apo- phæo- and erythro-retine), a bitter extractive, crystals of oxalate of lime, and vegetable acids, with starch and pectin.

Botany.—The rhubarbs are herbaceous plants, with perennial branching and succulent roots; the stems often grow from four to ten feet high, and contain oxalate of potash; the leaves are large, petiolate, more or less cordate; perianth petaloid, six-parted, withering; stamens usually nine; styles three, reflexed; achenes three-cornered, broadly winged; embryo in the centre of the albumen.

The species of rhubarb already described are numerous. Amongst them are—

Rheum Palmatum.—This is generally supposed to be the genuine rhubarb plant of China.

R: **Rhaponticum.**—Cultivated in England for its stems and roots.

R: **Undulatum.**—Grows in Siberia and China, and is cultivated in France.

R: **Compactum.**—A native of China; also cultivated in France.

R: **Emodi.**—Yields part of the Himalayan rhubarb.

R: **Webbianum.**—Also a native of the Himalayas, and affords some of the Indian rhubarb.

Adulterations.—It is almost impossible to detect adulterations in powdered rhubarb; inferior descriptions of the root are liable to be substituted for the better kinds; their physical characters are the best guide, and when of good quality they all feel gritty when chewed; if decayed or worm-eaten, they should be rejected. Rhubarb is occasionally rolled in powdered turmeric, to give it a bright colour; this is tested by a solution of boracic acid, which has no action on rhubarb, but turns turmeric brown.

Effects.—Rhubarb operates in small doses as a mild tonic and astringent; it is used to promote digestion in cases of dyspepsia, and is of benefit in irritable conditions of the bowels, to alter the alvine secretions, and restrain chronic diarrhœa; in combination with alterative mercurials and antacids, it is given in the scrofulous affections of young children, and tabes mesenterica. In full doses it operates as a gentle purgative, distinguished by its mild action, and subsequent tonic effects; it is therefore unsuited for febrile or inflammatory diseases, but is particularly valuable in treating the maladies of early life; for gouty and dyspeptic individuals, and to relieve the diarrhœa induced by improper or undigested food, or deranged bilious discharges; it is often combined with magnesia, and, when a more energetic action is desired, with sulphate of potash or confection of scammony. When taken, rhubarb becomes absorbed, and its colouring principle tinges the secretions, particularly the urine, and is asserted sometimes to render the milk of nurses purgative.

Dose.—As a tonic and astringent, powdered rhubarb is given in doses of three to ten grains; for an aperient, twenty to thirty grains is the average quantity; a drop or two of oil of nutmeg greatly improves its flavour.

PULVIS RHEI COMPOSITUS.—Compound Rhubarb Powder.—A useful antacid purgative, commonly termed Gregory's Powder, well adapted for bowel complaints and gouty affections.

Dose.—For adults, thirty to sixty grains; for children, five to twenty grains, given according to age, in some aromatic water.

Preparation.—Rhubarb in powder, ℥ij.; light magnesia, ℥vj.; ginger in powder, ℥j. Mix thoroughly, and pass through a fine sieve.

INFUSUM RHEI.—Infusion of Rhubarb.—This infusion is tonic, and mildly purgative; it is frequently used as a vehicle for other remedies, particularly antacids and aperients.

Dose.—f℥ss. to f℥ij.

Preparation.—Rhubarb, in thin slices, a quarter of an ounce; boiling distilled water, f℥x. Infuse in a covered vessel for one hour, and strain.

EXTRACTUM RHEI.—Extract of Rhubarb.—This extract is liable to be injured if over-heated during its preparation; when properly made, it retains the peculiar smell and taste of rhubarb.

Dose.—From five to fifteen grains.

Preparation.—Rhubarb, sliced or bruised, lb. j.; rectified spirit, f℥x.; distilled water, Ov.; macerate for four days; decant, press, and set by, that the undissolved matter may subside; pour off the clear liquid; filter the remainder; mix the liquors, and evaporate by a water bath, at a heat not exceeding 160°, to a proper consistence.

PILULA RHEI COMPOSITA.—Compound Rhubarb Pill.—This pill mass is constantly employed, as a mild and effectual purgative.

Dose.—Five to ten grains, that is, one or two pills; repeated, if necessary, every four hours.

Preparation.—Mix hard soap, in powder, ʒjss., with rhubarb, ℥iij.; Socotrine aloes, ℥ijss.; myrrh, ℥jss.; all in fine powder; add treacle, by weight, ℥iv.; English oil of peppermint, fʒjss.; and beat all to a uniform mass.

TINCTURA RHEI.—Tincture of Rhubarb.—This is usually prescribed as an addition to purgative draughts, being cordial, and mildly aperient.

Dose.—The average dose will range from f℥ss. to f℥j. When added to draughts, fʒij. to fʒiij. are used.

Preparation.—Rhubarb, ℥ij.; cardamoms, coriander, of each a quarter of an ounce, all bruised; saffron, a quarter of an ounce; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

RHUBARB WINE.—Has been omitted from the present list of officinal preparations; it is much used in some districts as a warm aperient in dyspeptic attacks, and slight dysenteric affections.

Dose.—From f℥ss. to f℥ij.

Preparation.—Rhubarb, ℥iij.; canella, ʒij., each in coarse powder; sherry wine, Oij.; macerate for fourteen days; strain, press, and filter (Pharm. Dub.).

Thymelæaceæ.—Shrubs, with tenacious bark; leaves entire, alternate, exstipulate; flowers rarely unisexual; perianth coloured, deciduous, with a distinct tube, and four-cleft limb; stamens eight, inserted in the top of tube; ovary free, with a single pendulous ovule; fruit, a berry or drupe; seed with or without albumen; embryo straight.

DAPHNE MEZEREUM.—**Mezereon.**—The dried bark of this shrub, and also of the *Daphne laureola*, or spurge laurel, is employed. Mezereon is cultivated in our gardens, and appears to be truly wild in some of the southern counties of England; it is a common European plant in hilly districts, where its fragrant flowers appear in early spring before the leaves. The spurge laurel is a native of southern and western Europe, and not uncommon in England; but is unknown in a wild state in Ireland; it abounds especially on clay soils. The bark is usually sold adhering to the hard inert wood, which should be removed; it consists of tough strips, olive-brown externally, white within, with a cottony fibrous liber, separating into lace-like layers; its odour is faintly nauseous, and its taste acrid. When recently gathered, it will blister the skin, if applied to it; and the berries, which are poisonous, sometimes produce dangerous irritant symptoms when eaten by children. Mezereon contains a neutral crystalline substance, termed daphnin, which has no important properties; an acrid volatile principle, that, according to Mr. Squire, passes off with the vapour of boiling water; and a dark green acrid resin, soluble in alcohol.

Effects.—Mezereon bark is considered diaphoretic and stimulant, and employed as an addition to the compound decoction of sarsaparilla.

Botany.—D : **Mezereum.**—An erect glabrous shrub; flowers appearing in spring in clusters along the preceding year's shoots, purple-coloured and fragrant; leaves lanceolate, deciduous, forming terminal spike-like tufts; berries red.

D : **Laureola.**—A shrub, with evergreen oblong leaves, crowded on the ends of the branches; flowers in short racemes, green and scentless; berries blackish-blue.

Myristicaceæ.—Tropical trees; bark with red-coloured juice; leaves exstipulate; flowers unisexual; perianth three to four-cleft, valvate; stamens three to twelve, distinct or monadelphous; anthers extrorse; female with deciduous calyx; carpels one or many, each with an erect anatropal ovule; fruit succulent, two-valved; albumen runcinate.

MYRISTICA OFFICINALIS.—**The Nutmeg Tree.**—Nutmegs are imported from Sumatra and the Moluccas. The fruit, which is pyriform, about the size of a peach, when ripe splits from its apex into two thick fleshy valves, displaying the bright scarlet or orange arillus, or **mace**, which covers over the hard thin shell of the nutmeg. Mace is prepared by being dried in the sun, when it becomes yellow and brittle; the nutmeg requires long-continued drying with gentle heat, after which the shells are broken, and the kernels extracted for commerce; they are occasionally dipped in a mixture of quicklime and water, to preserve them from the ravages of insects. A nutmeg consists of a small embryo, with thick cotyledons situated at one end of the oily albumen, which is marbled by the deep brown colour of the adhering endopleura, or inner coat of the shell; it affords a limpid volatile oil when distilled with water.

An oblong nutmeg, known in commerce as wild or male nutmeg, is the produce of *M. fatua;* it is less aromatic, and paler than the genuine variety, and should not be used for medical purposes; its mace is insipid.

Botany.—A tree, twenty-five to thirty feet high, resembling the pear; leaves faintly aromatic, alternate; male flowers small, in axillary racemes; female usually solitary; fruit pyriform, with a fleshy pericarp, splitting, and displaying its arillode, covering the thin hard nutshell, within which lies the nutmeg.

Effects.—Nutmeg is stimulant and aromatic, like other spices, and popularly used as an anodyne in mild attacks of diarrhœa, given with warm wine; in full doses it is considered to be slightly narcotic.

Oleum myristicæ.—This is directed to be distilled in England from the nutmeg. It is a colourless, or pale straw-yellow oil, having a strong odour and taste of the nut; the usual produce is about 4·5 per cent.; by agitation with water it separates into a light and heavy oil, and if kept deposits crystals of solid stearoptene. It is used for preparing the spirit of nutmeg, and in the pill mass of Socotrine aloes.

Myristicæ adeps.—Is a concrete oil, imported in firm orange-coloured cakes, of fragrant odour, often termed **oil of mace**; it is obtained by pressing the nutmegs, after previously heating them, and dissolves in four times its weight of boiling alcohol, or half that quantity of ether; a white fat deposits from the alcohol on cooling, which Playfair calls myristine; by saponification it yields glycerine, and a fatty acid. It is sometimes employed in ointments and stimulating liniments, and is a constituent of emplastrum picis.

SPIRITUS MYRISTICÆ.—Spirit of Nutmeg.—A carminative; used as a pleasant addition to flavour draughts, and added to the compound iron mixture.

Dose.—Five to fifteen drops.

Preparation.—Volatile oil of nutmeg, f℥j.; rectified spirit, f℥ix. Dissolve.

Lauraceæ.—Tropical trees; leaves exstipulate, coriaceous and dotted; perianth four to six-cleft, in two rows; stamens eight to twelve, the three or four innermost being abortive; anthers two or four-celled, opening by valves; ovary superior, one-celled, with one or two pendulous ovules; fruit a berry or drupe; embryo with large cotyledons, exalbuminous.

CINNAMOMUM ZEYLANICUM.—The Cinnamon Tree.—Several varieties of the genuine cinnamon tree are cultivated in Ceylon and Java; the finest bark is obtained from the Cinnamon Gardens, near Colombo. The bark peelers prefer selecting branches about three years old; these are lopped, and the cortex detached by making longitudinal incisions, and removed with the point of a knife; after twenty-four hours the external layers are scraped off, and, the smaller quills being introduced within the larger, they are dried in the sun, sorted according to quality, and prepared for exportation; the bark is re-examined in England, and the best quills made up into bales about three and a half feet long. The quills are slender, the bark being scarcely thicker than cardboard; its colour is light brown, and it is highly fragrant, with warm, agreeable taste; its constituents are volatile oil, with some resin, tannin, colouring matter, and woody fibre.

OLEUM CINNAMOMI.—Oil of Cinnamon ($C_{18}H_7O_2H$).—Is the hydride of cinnamyl, with a small portion of a hydrocarbon isomeric with turpentine. It is obtained by distilling the bark with water; when recent, it is pale yellow, becoming cherry-red through age, and slightly altered from the formation of some cinnamic acid by oxidizing; its sp. gr. varies from 1·025 to 1·05; it boils about 440°. The chemical relations of the oil are of interest: if heated with nitric acid, hydride of benzoyl is evolved, and benzoic acid remains in the solution; its composition may be regarded as similar to the hydride of benzoyl, with acetyl, C_4H_3, replacing an atom of hydrogen, thus—

$$\text{Hydride of benzoyl} = C_{14}H_5O_2,\ H;$$
$$\text{Hydride of cinnamyl} = C_{14}H_4\,(C_4H_3)\ O_2,\ H.$$

Cinnamic acid bears a similar relation to benzoic acid. Oil of cinnamon is used for flavouring purposes, and as a carminative; its high price renders it liable to adulteration with the coarse oil of cassia, from which it is best distinguished by its fragrant and pleasing aroma.

Botany.—A tree, above thirty feet high; leaves ovate, or ovate oblong, triple-nerved; flowers in panicles, usually bisexual; perianth six-cleft, the upper part deciduous; stamens twelve, in four rows, the three inner barren; fruit a one-seeded drupe.

Adulterations.—The inferior descriptions of genuine cinnamon bark are thicker, darker in colour, and more pungent, but less aromatic than the finer kinds; in commerce cassia bark is frequently substituted for cinnamon; its quills are coarse and thick, packed in small bundles, and easily distinguished by their strong flavour. A decoction of cinnamon is unaffected with tincture of iodine, which strikes a blue colour with the infusion of cassia.

Effects.—In addition to its aromatic properties, cinnamon is considered to possess some influence in restraining excessive uterine discharges, for which purpose the tincture is generally prescribed.

Dose.—Of powdered cinnamon, from ten grains to thirty, seldom used.

AQUA CINNAMOMI.—**Cinnamon Water.**—An agreeable vehicle for other remedies; it should not be given with iodine and iodide of potassium, which form a crystalline compound with oil of cinnamon (Apjohn).

Dose.—f℥ss. to f℥ij.

Preparation.—Bruised cinnamon, ℥xx.; water, two gallons. Distil one gallon.

TINCTURA CINNAMOMI. — **Tincture of Cinnamon.** — Added to astringent mixtures for its aroma, and alleged to have some effect in arresting menorrhagia, when given in doses of f℥ij. to fʒiv.

Preparation.—Cinnamon, in coarse powder, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation similar to tincture of aconite; to yield Oj.

PULVIS AROMATICUS. — **Aromatic Powder.**—Used in astringent and carminative mixtures for its warmth and flavour.

Dose.—Five to thirty grains.

Preparation.—Cinnamon, ℥iv.; nutmeg, ℥iij.; saffron, ℥iij.; cloves, ʒjss.; cardamoms, freed from their capsules, ℥j.; refined sugar, ℥xxv.; powder each separately; mix thoroughly, and pass the powder through a fine sieve; keep in a stoppered bottle.

CASSIA BARK.—Is not officinal; it is obtained in China and Java, and imported through Singapore, packed in small-sized bundles; the quills are thick, consisting of a single layer of cortex, or at most of two, of dark brownish colour, with a strong pungent odour, and coarse rank flavour, deficient in fragrance; it is possible that the cassia bark of commerce is derived from more species than one; when analyzed, it affords 0·8 per cent. of volatile oil, with resin, gummy and extractive matter; and its decoction is rendered blue by tincture of iodine, which distinguishes it from true cinnamon.

Oil of Cassia.—Is similar to oil of cinnamon in composition, but easily recognised by its strong odour and taste; it is stated to be sometimes adulterated with oil of cloves, which can be tested with a little nitric acid, by which the oil of cassia is changed into a crystalline mass; but clove oil if present swells up, evolves red vapours, and is converted into a thick reddish oil.

Botany.—*Cinnamomum Cassia* is a tree, about fifty feet high; leaves oblong lanceolate, triple-nerved; petioles and younger branches downy; flowers white, disposed in panicles.

CAMPHORA OFFICINARUM.—**The Camphor Tree.**—Camphor is imported from China and Japan. It is stated to be procured in China by macerating the chopped branches in water and boiling them until the camphor separates; it concretes, and is collected as the water cools, and afterwards is subjected to coarse sublimation in copper vessels; when brought to this country, it is packed in square boxes, and consists of dirty greyish-coloured grains, mixed with a variable amount of impurities. Japanese camphor is alleged to be got by boiling the chopped root and wood of the tree in water contained in an iron vessel, to which a large earthen head is fitted, loosely filled with straw, on which the camphor condenses as it rises in vapour; it is imported in tubs, and consists of different sized masses, made up of aggregated pinkish grains; it is cleaner, and bears a higher price than ordinary camphor, but is not often met in commerce.

The crude camphor requires to be resublimed in thin glass vessels with narrow mouths, some quicklime being added to it to retain the impurities, and the heat so regulated by a sand bath that the camphor gradually forms a solid cake in the upper part of the flask; from this it is subsequently extracted when cool, by cracking the glass vessel. Camphor usually consists of large turban-shaped cakes or rings, semi-crystalline, and translucent; its odour is strong, aromatic, and penetrating, and it has a bitter and cooling taste; its sp. gr. varies with the temperature, being about 0·98; exposed to the air, it slowly evaporates; it melts at 347°, and when ignited burns with a bright flame, and much smoke; though tough, it readily pulverizes on the addition of spirit of wine, and it is freely soluble in chloroform; it also dissolves in rectified spirit, and the volatile and fixed oils; it imparts to water its peculiar odour and taste, but is very slightly soluble in it, Oj. only taking up about gr. vij.; a remarkable rotatory motion ensues during its solution, when a fragment of camphor is dropped into water, caused by the rapid evaporation taking place at the points of contact.

Laurel camphor is considered to be a concrete volatile oil, possibly derived from the oxidation of terebinthinate substances existing in the tree, as it contains two atoms of oxygen more than oil of turpentine, its composition being $C_{20}H_{16}O_2$; a similar substance is furnished by several essential oils when exposed to the air, particularly the volatile oils of the labiatæ. Three isomeric modifications of camphor are known, which are distinguished only by their action upon a ray of polarized light: common camphor produces rotation of the ray to the right; the camphor got from the oil of *Matricaria parthenium* exerts a left-handed rotatory power; and the camphor deposited by oil of lavender has no obvious effect.

Borneo camphor is highly prized in Chinese pharmacy, but is seldom imported; it differs in containing two additional atoms of hydrogen, consisting of $C_{20}H_{18}O_2$, and is harder, and less fusible or volatile; it is procured from a *Dryobalanops*, by splitting the wood, and gathering the crystallized grains, or by collecting the limpid oil, borneen, $C_{20}H_{16}$, which flows from artificial incisions made in the tree, and distilling it, which separates the camphor.

BOTANY.—An evergreen tree, strongly smelling of camphor; leaves on long petioles, ovate lanceolate, triple-nerved; flowers small, hermaphrodite, in corymbose panicles; perianth six-cleft; stamens twelve, in four rows, the inner barren; berry round, the size of a black currant; seed solitary.

EFFECTS.—Taken in quantities exceeding thirty grains, camphor excites pain and heat in the stomach, lassitude, giddiness, convulsive symptoms, and vomiting, by which it is usually expelled in greater part; maniacal delirium, congestion of the face, and sopor may ensue, but are rarely witnessed. Considerable discrepancy exists in the statements respecting the therapeutic effects of camphor; its action is most evident when used with hysterical and hypochondriacal persons; and whilst some are disproportionately fond of it, others consider its odour most unpleasant. In small doses it seems to be mildly stimulant, at the same time relieving nervous excitement and restlessness; and if united with diaphoretics, it appears to increase their energy: prescribed in full medical doses, it allays pain and spasmodic affections, and is sometimes used combined with chloroform or hyoscyamus, to induce sleep in mania, delirium tremens, bronchitis, and urinary diseases; and in general for all those cases where opium is contra-indicated or disagrees. A special sedative influence over the sexual organs has long been ascribed to it, which has led to its use for treating chordee, and irritability of the bladder resulting from disease, or induced by employing turpentine or cantharides, though some writers charge it with inducing strangury, and being aphrodisiac.

Locally it is applied in lotions and liniments, to relieve rheumatic and muscular pains, for chilblains, and to disperse chronic glandular swellings; when mixed with mercurial ointment, it renders it semifluid, and facilitates its absorption; if rubbed with benzoin or gum ammoniac, it forms a soft paste, and the fœtid gum resins will deprive it of odour; twenty to thirty grains of camphor, applied in power on a poultice to the perinæum, is recommended to relieve the chordee attending on gonorrhœa; in ointment it is used to dress indolent and gangrenous ulcers, and for those cutaneous eruptions attended with itching. A dusting powder composed of camphor, mixed with four to eight parts of starch, is strongly advised for the distressing chronic pruritus of the vagina and labia. The ointment will also prevent or rapidly heal the chapped hands and irritation of the face which result from exposure to damp or harsh wintry air.

Antidotes.—As no direct antidote is known, the stomach should be promptly evacuated, and afterwards stimulants given if necessary; opium is considered useful.

Dose.—One to five grains, or occasionally up to ten grains, may be given; preferably suspended in emulsion with some mucilage or yolk of egg. For liniments it is freely dissolved by chloroform, rectified spirit, or oil.

AQUA CAMPHORÆ.—Camphor Water.—This is commonly termed camphor mixture; as water dissolves camphor in small proportion (scarcely gr. ss. to f℥j.), it is chiefly used to exhibit other remedies.

Dose.—Usually from f℥ss. to f℥ij.

Preparation.—Suspend camphor, ℥ss., in pieces, in a muslin bag from the stopper of a jar containing distilled water, one gallon; invert the jar; let it stand for at least two days, and pour off the solution as required.

SPIRITUS CAMPHORÆ.—Spirit of Camphor.—When added to water, the greater part of the camphor precipitates; it is sometimes used for making an extemporaneous camphor mixture, or can be given internally, suspended with sugar or mucilage, fʒss. being equivalent to gr. iij. of camphor. It is principally employed for liniments; applied to rheumatic pains, chilblains, sprains, &c.

Preparation.—Camphor, ℥j.; rectified spirit, f℥ix. Dissolve.

TINCTURA CAMPHORÆ CUM OPIO.—Camphorated Tincture of Opium.—Or paregoric elixir; this might be equally well prepared extemporaneously, by adding an equivalent amount of laudanum to the other ingredients, dissolved in proof spirit; each f℥ss. contains one grain of opium; it forms a useful anodyne in pectoral affections unattended with active inflammation, relieves cough, and over-sensibility of the bronchial tubes, and will check profuse catarrhal discharge.

Dose.—For the adult, from fʒss. to fʒij.

Preparation.—Opium, in coarse powder, gr. xl.; benzoic acid, gr. xl.; camphor, gr. xxx.; oil of anise, fʒss.; proof spirit, Oj.; macerate for seven days; strain, press, and filter; then add proof spirit to make up Oj.

LINIMENTUM CAMPHORÆ.—Liniment of Camphor.—Camphorated oil is applied with friction as a rubefacient; and frequently rubbed to hard breasts after weaning, to assist the dispersion of milk.

Preparation.—Camphor, ℥j.; olive oil, f℥iv. Dissolve.

LINIMENTUM CAMPHORÆ COMPOSITUM.—Compound Liniment of Camphor.—A powerful stimulating and rubefacient application, much used in embrocations.

Preparation.—Camphor, ℥ijss.; English oil of lavender, fʒj.; rectified spirit, f℥xv.; dissolve, and add strong solution of ammonia, f℥v., gradually, agitating until the whole is dissolved.

SASSAFRAS OFFICINALE.—The Sassafras Tree.—Is a native of the Northern American forests; the wood of its stem is spongy and white, becoming reddish in old trees, and rather fragrant; the root, which is officinal, is imported in logs, covered with portions of brownish corky epiderm; within this the layers of ligneous tissue are more aromatic than in the trunk or branches; it is porous, brittle, of light greyish-brown colour, yielding about one per cent. of aromatic oil.

Effects.—Sassafras is considered sudorific and alterative; it is used for rheumatic and syphilitic affections, and enters into the compound decoction of sarsaparilla.

Botany.—A small tree or bush; stem rough and grey; twigs smooth, green-coloured; leaves petiolate, deciduous, downy when young, oval or two to three-lobed; flowers in racemes, perianth six-parted, pale yellowish-green; stamens nine, the three inner ones glandular; female with sterile stamens; drupe dark blue, about the size of a pea, surrounded by the remains of the perianth.

NECTANDRA RODIÆI.—The Bebeeru.—Or green heart, is a large and valuable tree, used for shipbuilding, which is obtained in British Guiana, growing near the rivers on rocky hills; its bark consists of large, flat, heavy pieces, from one to two feet in length, two to six inches broad, and about a quarter of an inch thick; greyish-brown outside, dark cinnamon-coloured within; hard and brittle; tasting strongly and persistently bitter and astringent, but without aroma or acridity; it affords from two to three per cent. of an alkaloid, beberia, combined with beberic acid; sipiria, a product of the oxidation of the beberia; and the ordinary vegetable constituents, starch, woody fibre, resin, and gum.

Used—To prepare the sulphate of beberia.

Botany.—A forest tree, upwards of sixty feet high, with large coriaceous oblong leaves; flowers yellowish-white, in axillary panicles; calyx six-parted; stamens twelve, the three inner sterile; berry hard and brittle, one-seeded, globular, about the size of an apple, greyish-brown coloured, with white dots.

BEBERIÆ SULPHAS.—Sulphate of Beberia.—($C_{38}H_{21}NO_6, HO + SO_3$).—This substance occurs in bright brownish-yellow shining scales, which afford a yellow powder; its taste is bitter and persistent; it dissolves in alcohol, and is sparingly soluble in water, unless acidulated with dilute sulphuric acid, when it is freely taken up. By precipitating with caustic soda, pure beberia is obtained, which is soluble in ether, and can be got as a yellow translucent mass by evaporating its ethereal solution.

Preparation.—Mix sulphuric acid, f℥ss.; water, one gallon; with this moisten bebeeru bark in coarse powder, lb. j.; macerate for twenty-four hours; place in a percolator, and pass through it the rest of the acidulated water. Concentrate to Oj.; add gradually slaked lime, three-quarters of an ounce, in the form of milk of lime, agitating well, and taking care that the liquid remains distinctly acid. After two hours filter through calico; wash the precipitate with a little cold distilled water, and add to the filtrate solution of ammonia, until it has a faint ammoniacal odour; collect the precipitate on a cloth, wash twice with cold water, f℥x.; squeeze gently with the hand, and dry it on a vapour bath; powder the dry precipitate, and boil in a flask with rectified spirit, f℥vj.; after resting for a few minutes, pour off the spirit; treat the undissolved part with fresh spirit till exhausted. Mix the spirituous solutions; add distilled water, f℥iv., and distil so as to recover most of the spirit. To the residue add gradually, with constant stirring, dilute sulphuric acid till the fluid reacts slightly acid; evaporate to complete dryness on a water bath; powder; gradually add distilled water, Oj.; stir well, and filter through paper; evaporate to the consistence of syrup, and spread in thin layers on flat glass or porcelain plates, and dry at a heat not above 140°; preserve it in stoppered bottles.

Beberia is dissolved out in an impure state by the water acidulated with sulphuric acid; on adding lime, the excess of acid and much resinous matters are got rid of, afterwards ammonia throws down beberia; this is redissolved in spirit, and the solution diluted with water, and distilled to expel the spirituous menstruum; finally, it is separated from sipiria, which is considered to be an oxidized product of the beberia, by being formed into a sulphate, which is soluble in distilled water, and obtained in scales by being dried on glass plates.

Effects.—This salt has been introduced as a substitute for quinia, and is alleged to possess similar tonic and antiperiodic properties; its taste is intensely bitter, and rather unpleasant; its advantages are stated to be, that it seldom deranges the stomach, or causes headach, giddiness, or febrile symptoms. It appears to have been successfully used in India; but some practitioners at home have not found it of decided value, at least in the treatment of ague, though they consider it of service for neuralgic affections, and dyspeptic attacks, and generally as a tonic remedy in diseases of debility.

Dose.—It may be given in doses of gr. j. to gr. iij. as a tonic; and from gr. v. to gr. xx. for a febrifuge and antiperiodic in ague. When prescribed in solution, it is best dissolved with a little dilute sulphuric acid, and flavoured with tincture of orange.

Aristolochiaceæ.—Herbs, or climbing shrubs; wood arranged in separable wedges; flowers brown or greenish; perianth tubular, valvate; stamens six to twelve, epigynous, distinct, or adhering to the style and stigmas; ovary three to six-celled; ovules numerous; stigmas radiating; fruit a capsule or berry; seeds albuminous; embryo minute.

ARISTOLOCHIA SERPENTARIA. — **Virginian Snake Root.**—Is imported in bales from the Western States of America. It consists of tufts of long slender and brittle fibres, of yellowish colour, attached to a contorted rootstock, having an aromatic odour, and warm bitter taste, like a mixture of valerian and camphor; the odour is ascribed to a green volatile oil; the bitterness depends on slightly acrid extractive matter.

Botany.—Rootstocks perennial; stems herbaceous, numerous, irregularly-jointed; leaves cordate, acuminate; perianth bent like the letter S, inflated at its extremities; stamens six; capsule six-angled, six-celled, obovate.

Effects.—Serpentaria is one of the numerous remedies recommended for the bites of rattlesnakes; its properties are stimulant and tonic; it was formerly much used in febrile and intermittent affections, combined with or as a substitute for cinchona.

INFUSUM SERPENTARIÆ.—**Infusion of Serpentary.**—Prescribed as a mild stimulant and tonic; often given with preparations of bark.

Dose.—f℥ss. to f℥ij.

Preparation.—Serpentaria, a quarter of an ounce; boiling distilled water, f℥x. Infuse for two hours, and strain.

TINCTURA SERPENTARIÆ.—Tincture of Serpentary.—Usually added to tonic infusions.

Dose.—f℥j. to fʒij.

Preparation.—Serpentaria, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, similar to tincture of aconite; to yield Oj.

Euphorbiaceæ.—Herbs, shrubs, or trees, with acrid milky juice, much varied in foliage and inflorescence; leaves alternate, usually stipulate; flowers unisexual, with or without a perianth; stamens variable, distinct, or in bundles; ovary usually of three united carpels, each with one or two pendulous ovules, separating and dehiscing when ripe; seed with large embryo, in fleshy albumen.

CROTON ELEUTERIA.—Cascarilla.—The sweet wood bark, or cascarilla, is obtained from the Bahama Islands, from one of which it derives its name of Eleuteria bark; it consists of irregular twisted fragments and small quills, seldom exceeding one to three inches in length, and varying from the thickness of a quill to that of the little finger; its colour externally is dull brown, changed to grey by numerous adhering lichens, with a much-fissured epiderm, not unlike grey cinchona; the substance of the bark is compact and hard, breaking with a short resinous fracture; it has a bitter, warm, and slightly aromatic taste, and agreeable odour, becoming fragrant when burned, and resembling vanilla. Cascarilla contains a small portion of sweet-smelling volatile oil, resin, tannin, and the ordinary vegetable matters, with a white, very bitter substance, termed cascarillin, that is sparingly soluble in water.

Botany.—A scanty-leaved shrub, from three to five feet high, sometimes becoming a small tree; leaves petiolate, slightly cordate at the base, acuminate, densely covered with silvery scales beneath; flowers numerous, small, in dense spikes; fruit a small three-lobed capsule, like a pea, each with one dark shining seed.

Effects.—Cascarilla is an aromatic bitter, with little astringence, chiefly given in dyspepsia and chronic affections, where a mild tonic is indicated; from its fragrance whilst burning it is used for making pastilles, and often employed by tobacco smokers, but its vapour is alleged sometimes to cause giddiness.

INFUSUM CASCARILLÆ.—Infusion of Cascarilla.—A useful tonic infusion, frequently given combined with the mineral acids or alkalies.

Dose.—From f℥ss. to fʒj., thrice daily.

Preparation.—Cascarilla, in coarse powder, ℥j.; boiling distilled water, f℥x. Infuse in a covered vessel for one hour, and strain.

TINCTURA CASCARILLÆ.—TINCTURE OF CASCARILLA.—Usually added to the infusion, or to other tonic bitters.

DOSE.—From f℥ss. to f℥ij.

PREPARATION.—Cascarilla, bruised, ℥ijss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

CROTON TIGLIUM.—THE PURGING CROTON.—This tree is a native of India, Ceylon, and the islands of the Indian Archipelago; its seeds were formerly much employed in medicine as a drastic purgative, but fell into disuse until croton oil was obtained from them, and introduced as a remedy about forty years since. They resemble castor oil seeds in size and shape, and are covered with a brown testa, outside of which a yellow epiderm is usually adherent; the endocarp is thin and brittle, and the oily yellowish albuminous kernel envelopes a large embryo, with thin leafy cotyledons; they have no odour; their taste is oleaginous, and afterwards acrid; by pressure, from one-fourth to one-half their weight of oil can be obtained from them.

BOTANY.—A tree, from fifteen to twenty feet high; leaves membranous, ovate, three to five-nerved, on short petioles; racemes small, erect, and terminal, the males at the apex; calyx five-cleft; petals five; stamens five to twenty; females with a permanent calyx; capsule the size of a hazel nut, covered with minute hairs, three-celled.

OLEUM CROTONIS.—CROTON OIL.—Is directed to be got from the seeds, by expressing them in England; it always has a deep brown tint when thus made, whilst the oil imported from abroad varies from pale amber to deep yellow; it is slightly viscid; its odour is unpleasant and nauseous, and its taste acrid and persistent, causing a disagreeable sensation in the fauces. When saponified, croton oil yields crotonic acid, which Pelletier considered was its active principle; but Mr. Redwood's researches lead to the conclusion that both crotonic acid and the crotonates are nearly inert.

ADULTERATIONS.—It is asserted that the oil of *Jatropha curcas*, another euphorbiaceous plant, is occasionally added to foreign-pressed croton oil; its effects on the bowels are similar, though less energetic; no satisfactory mode of determining its presence is known. The officinal test is, that when agitated with its own volume of alcohol, and gently heated, croton oil forms a clear solution, from which about three-fourths of the oil separates on cooling; but Pereira's observations show that English croton oil is soluble without heat, and does not again separate unless exposed to a low temperature. Foreign oil requires heat for its solution, and after twenty-four hours deposits again, somewhat increased in bulk from taking up a little of the spirit.

Effects.—An overdose of croton oil rapidly induces symptoms which resemble an attack of malignant cholera, and may be followed by speedy and fatal collapse; in one instance, though the patient survived, I have known the depression to continue for upwards of a week. A single grain of the seed will frequently cause full purgation; when the oil is given in moderate doses of one or two drops, it acts as a powerful hydragogue, causing frequent watery evacuations, often within less than an hour; unfortunately its effects cannot always be relied on, whilst in some cases it proves extremely violent, and is apt to gripe and nauseate. The smallness of its dose enables us to employ it in many diseases where the patient is unable or disinclined to take medicine, as apoplexy, palsy, and maniacal affections; and also when rapid and effectual purgation is required for obstinate constipation, cerebral diseases, or lead colic.

Applied externally, by rubbing it on the skin, the oil excites rubefaction, and an eruption of small vesicles, which soon form a purulent secretion; it is employed to produce counter-irritation in incipient phthisis, chronic pneumonia, and bronchitis, for severe neuralgic pains, and in chronic diseases of the joints; for this purpose it is used twice in the day, or oftener, either undiluted, or mixed with one to seven parts of olive oil, turpentine, or soap liniment. It will induce a smart attack of erysipelatous redness and swelling if placed in contact with the face or scrotum; and I have observed considerable irritation of the eyes and face resulting from exposure to the vapour of a liniment which was used to the chest. For obliterating nævi, it has been proposed to inoculate the erectile tissue with four or five small punctures of a needle dipped in the oil; each spot inflames, and produces a small ulcer.

Antidotes.—In poisoning with croton oil, its expulsion from the stomach is the first indication, and oily fluids should be freely taken; in one case I saw melted butter used with great advantage; afterwards suitable means must be employed to relieve the gastro-enteric symptoms.

Dose.—One or two drops, made into pill; or dropped on the tongue when the patient is unable to swallow; in mania it can be given mixed with sardines, which effectually disguise its taste. A sapo crotonis is made by saponifying two parts of croton oil with one of solution of soda; its dose is gr. j. to gr. iij.

LINIMENTUM CROTONIS.—Liniment of Croton Oil.—Used to produce counter-irritation; rubbed once or twice daily to the skin until an eruption appears.

Preparation.—Croton oil, fʒss.; olive oil, fʒiijss. Mix.

RICINUS COMMUNIS.—The Castor Oil Plant.—Or Palma Christi, is a native of India, where some varieties grow to the size of small trees, and are perennial; it is cultivated as an ornamental annual in this country, and extensively planted in America for preparing the oil. Two descriptions of seed are recognised, differing slightly in size; the smaller are considered more productive of oil; they are pale grey, marbled with yellowish-brown spots, about four lines long, three broad, and one and a half thick, having a tumid strophiole at the upper end; within the brittle seedcoat is a thin papery membrane, covering the oily albumen and embryo with its leafy cotyledons.

Botany.—Several species are known; the stems are hollow, jointed, and glaucous; petioles long, with a gland near the palmate seven-lobed leaf; flowers monœcious, in long panicles, males below; stamens polyadelphous; female with a short style, and three bilobed stigmas; fruit a tricoccous spiny capsule, each cell one-seeded.

OLEUM RICINI.—Castor Oil.—Is obtained by expressing the kernels after removing the inert seedcoats; this is effected in England by a powerful screw-press, in an artificially-heated room; the oil which flows out is afterwards purified by subsidence and filtration, and subsequently bleached by long-continued exposure to sunlight. In India, after expression, the oil is boiled with water, and the coagulated albumen and mucilage which separate are skimmed off; the oil is then strained through flannel, and placed in canisters for sale, constituting the ordinary oil of commerce; it usually is of good quality, with slight taste or odour. American castor oil is prepared in a somewhat similar manner; it is liable to deposit a white crystalline fat in cold weather, but is of fair reputation. West Indian oil is seldom imported; it is got by decoction of the seeds in boiling water; its colour is dark brown, and its taste is acrid and disagreeable.

Castor oil is viscid; its sp. gr. is about 0·969; the finest descriptions are faint yellow, with slight odour, and little taste; common oils are yellow or brownish, their smell is nauseous, and they have an acrid, unpleasant flavour. According to Saalmuller, castor oil consists of two different oils—ricinolein and margaritine, which by saponification afford fatty acids and glycerine; it should dissolve in its own volume of alcohol, or two of rectified spirit; and Pereira found that it conferred on other fixed oils, when mixed with them, the property of also dissolving in alcohol.

Effects.—The seeds possess acrid properties; two or three will purge violently, and twenty have destroyed life, with all the symptoms of malignant cholera; copious draughts of lemon juice are stated to mitigate their effects, which, according to Guibourt, depend on a principle that pervades the entire kernel. The oil is a safe and mild purgative, acting within two or three hours after being taken; it seldom gripes, but its taste is liable to nauseate, particularly if old or rancid, and some entertain insuperable objections to it in any form; it is constantly prescribed during the period of pregnancy and after childbirth, for diseases of the pelvic viscera, colic, attacks of recent dysentery requiring the administration of purgatives, in obstinate constipation resulting from indurated fæces, and in affections of the bladder or uterus; in flatulent distention of the bowels the addition of oil of turpentine adds greatly to its effects, and it is also given with full doses of turpentine to expel tape worm, but possesses no direct anthelmintic properties. Castor oil is the best aperient we can use with infants; still it should be a rule to avoid the indiscriminate administration of this or any other medicine unless clearly indicated; the routine practice of purging all infants immediately after their birth is most unnecessary.

Dose.—For the adult, from f℥ss. to f℥j.; some are affected rapidly by teaspoonful doses; it is given on some aromatic water, warm milk, coffee, wine, or spirituous liquids, according to the taste of the patient; others prefer it made into emulsion with mucilage or yolk of egg. For young children the dose varies from fʒj. to fʒiij., according to age. Castor oil is often added to enemas; for this purpose, f℥j. to f℥iij. may be employed.

ROTTLERA TINCTORIA.—**Kamela.**—Is obtained from the exterior of the capsules of this euphorbiaceous tree; it is an orange-red granular powder, largely employed in India for dyeing, and as a popular remedy for expelling worms; it is difficult to mix with water; ether separates it into a soluble resin, and an insoluble portion, which is shown by the microscope to consist of stellate hairs; the resin also dissolves in boiling alcohol, with which it forms a red solution, or in alkaline fluids.

Botany.—A tree, from twenty to thirty feet high; leaves alternate, petiolate, three-nerved, oblong, and pointed, with two brown glands on the upper surface, near the base of the leaf; flowers diœcious; racemes axillary and simple, or terminal and paniculate; capsule roundish, three-celled, about the size of a small cherry, covered on the outside by much red powder.

Purity.—It should be perfectly soluble in ether, leaving only tufted hairs.

Effects.—I have not found kamela equal to cusso or male fern oil in treating cases of tænia solium; its advocates allege that it seldom causes any unpleasant symptoms beyond nausea and slight griping pain, and that the worm is usually expelled dead; before giving it, the bowels should be well cleared out, and only liquid food employed during the time, to expose the parasite as much as possible. Applied locally, it acts as a desiccant, and will rapidly dry up the eruption of herpes labialis, if used early.

Dose.—Usually about sixty grains are given every three or four hours, for four doses; some recommend a larger quantity, as a quarter to half an ounce, followed by a brisk purgative if necessary;

others think that a strong tincture is equally effectual, and milder; for this purpose, kamela, ℥iv., is macerated in rectified spirit, Oj., and f℥ij. to f℥iv. given for a dose.

Piperaceæ.—Shrubs, or herbs, stems jointed; woody tissue, arranged in wedges; leaves usually opposite or verticillate; flowers hermaphrodite, in spikes, each on a bract; no perianth; stamens two or more; ovary free, one-celled; fruit somewhat fleshy, indehiscent, one-seeded; embryo in a vitellus, outside the albumen, and at the apex of the seed.

PIPER NIGRUM.—Black Pepper.—Is extensively cultivated in the tropics; the berries are gathered so soon as they are observed turning in colour from red to green, and dried in the sun, as when fully ripe they lose a portion of their acridity; heavy pepper is most esteemed, the best consisting of smooth hard grains. White pepper is procured by soaking the ripe fruit in water to burst its integument, and, after removing this outer coating by rubbing it off, the centre portion, is dried for use. The acrid and aromatic flavour of pepper depends on the presence of a volatile oil and resin; it also contains piperine, a crystalline, acrid, odourless substance of white colour, which can be procured from cubebs and other peppers, composed of $C_{34}H_{19}NO_6$, soluble in alcohol, forming a red liquid with sulphuric acid, and when distilled with potash producing piperitine, an oily base of pungent odour. Piperine has been employed in agues as a substitute for quinia.

Botany.—Perennial, with a climbing stem, eight to twelve feet high, dichotomously branched and jointed; leaves ovate acute, five to seven-nerved, dark green, glossy above; spikes opposite the leaves, stalked, three to six inches long, slender and drooping; flowers some unisexual, others hermaphrodite; stamens three; fruit the size of a large pea, first green, then red, and finally black, covered with pulp.

Effects.—Pepper is employed during the cold stage of ague; but its alleged antiperiodic properties do not appear well founded; it has also been given instead of cubebs, and has some reputation in affections of the rectum, piles, and fistulas, for which confection of pepper is substituted instead of a quack remedy termed Ward's Paste. Sir B. Brodie considered it acted as a local stimulant, and that it should be persevered in for a lengthened period; in some instances it deranges the stomach so much that it cannot be prescribed.

CONFECTIO PIPERIS.—Confection of Pepper.—Is frequently used, combined with confection of senna, for diseases of the rectum; oil of fennel formerly entered into its composition.

Dose.—Half a teaspoonful to a teaspoonful, once or twice in the day.

Preparation.—Black pepper, ℥ij.; caraway, ℥iij., each in fine powder; clarified honey, ℥xv. Mix.

CUBEBA OFFICINALIS.—The Cubeb Pepper.—Cubebs, or Java pepper, are gathered both from cultivated and wild plants; the unripe berries, after being collected, are dried in the sun; they resemble black pepper in shape, but are lighter coloured, and have an adhering stalk two or three lines long, whence they were formerly termed *Piper caudatum*; if bruised, their odour is aromatic, and they have a warm camphoraceous taste; distilled with water, they afford about ten per cent. of volatile oil, oleum cubebæ, which is officinal. This oil is pale green, or colourless, lighter than water, possessing the peculiar spicy taste and smell of the berries; it consists of $C_{30}H_{24}$. Cubebs also contain a resinous substance; and a principle termed cubebin, that closely resembles piperin.

Botany.—Stem climbing; leaves four to six inches long, oblong acuminate, strongly veined, coriaceous; spikes at the end of the branches, diœcious; fruit larger than black pepper, globose, with adhering pedicels.

Effects.—Cubebs are carminative, like other peppers; they are used for treating gonorrhœa, for which some employ full doses from the earliest stages of the discharge, others prefer giving moderate quantities after subduing any active inflammatory symptoms; unless their influence is decided within a few days, they seldom prove of service; they are liable occasionally to derange the stomach, and cause headach, and an eruption resembling urticaria. In gleet, they are often combined with preparations of iron, as the saccharated carbonate; and are of some benefit in chronic bronchitis, catarrhal affections of the bladder, and for chronic abscess of the prostate; the small doses of five to fifteen grains of cubebs recommended by Sir B. Brodie are best suited for such cases.

Cubebs powder rapidly deteriorates, from the escape and oxidation of its volatile oil; and in almost every instance this oil can be substituted with advantage for it.

Dose.—The average quantity is twenty to sixty grains, given three or four times in the day, mixed with water, or combined with copaiba; some employ a quarter of an ounce for each dose. Of the essential oil, the dose ranges from gtt. v. to gtt. xx., dropped on sugar, or in emulsion.

ARTANTHE ELONGATA.—Matica.—Matico leaves were introduced some years since as a powerful styptic and astringent. The plant is a native of Peru, where it is popularly used for checking hæmorrhages; its leaves are imported compressed in bales, attached to their stalks, and often with the flowering spikes adherent; they are coarsely veined, two to eight inches long, slightly downy on their under surface, having an aromatic odour that resembles sage, and a warm bitterish taste: according to the analysis of Mr. Stells, they contain a volatile fragrant oil, and soft ruby-red resin.

Botany.—A shrub, about twelve feet high, with jointed stems and branches; leaves rough, oblong lanceolate; spikes cylindrical, opposite the leaves; bracts lanceolate; flowers hermaphrodite.

Adulteration.—There are several allied species of matico; one of these, the *Artanthe adunca*, has lately been imported instead of the officinal herb, and described by Prof. Bentley; the substitution is of little practical importance, their properties being similar.

Effects.—When matico is applied to recent cuts and small bleeding vessels, some consider that it arrests the hæmorrhage in a mechanical manner, by promoting coagulation of the blood; but it appears to possess direct styptic power, and is useful as a vulnerary in bleeding from the gums, tongue, or nose, for which purpose the leaves can be employed, softened in warm water; the infusion is also prescribed for internal hæmorrhages from mucous surfaces, as menorrhagia and hæmoptysis, for chronic cases of catarrh of the bladder; and injected into the vagina for leucorrhœal discharges.

INFUSUM MATICÆ.—Infusion of Matico.—Given internally in doses of f℥ss. to f℥ij.; and also used topically as an injection, in affections of the rectum or vagina.

Preparation.—Matico, cut small, ℥ss.; boiling distilled water, f℥x. Infuse in a covered vessel for half an hour, and strain.

Urticaceæ.—Herbs, trees, and shrubs; leaves alternate, scabrous, stipulate; flowers unisexual or hermaphrodite, scattered, in catkins, or heads; perianth usually divided, with the stamens inserted into it; filaments sometimes curved; ovary free, one or two-celled, each with one ovule. The suborders are—

Urticeæ (not officinal).

Cannabineæ.—Scabrous plants, with watery juice; filaments erect, indehiscent; seeds exalbuminous. Examples—

Cannabis Indica. | Humulus lupulus.

Ulmaceæ.—Trees and shrubs; leaves rough; juice watery; fruit a samara or drupe; embryo straight or curved. Example—

Ulmus campestris.

Moreæ.—Rough-leaved trees, or shrubs; juice milky; fruit a sorosis or syconus; embryo hooked. Examples—

Morus nigra. | Ficus Carica.

Artocarpaceæ (not officinal).

CANNABIS INDICA.—**Indian Hemp.**—Differs from common hemp merely in the relative abundance of resinous secretion, the result of perfect development in a hot climate; it has long been habitually employed in the East as an intoxicating agent; the dried plant, termed *gunjah*, is sold in the bazaars in cylindrical bundles about two feet long and three inches thick, consisting of the stems, leaves, and flowering tops of about twenty-four distinct plants; from this the extract is obtained. A pure resin, collected by the hand from the hemp in Central India, is distinguished as *churrus*.

Botany.—A diœcious herb, of annual growth, three to eight feet high, branching; leaves viscid, on long petioles, scabrous, digitate, composed of five to seven lanceolate serrate leaflets; males in a drooping panicle; stamens five; females in erect spikes, with bracts; perianth a small persistent sepal; ovary one-celled, with an oily seed.

Effects.—The plant is officinal for preparing the resin. In Eastern countries it has been long celebrated for its narcotic and intoxicating properties, causing, when smoked, or used in substance, a state of pleasing excitement, with phantasms, increased mental and sexual energy, and the alleviation of pain and spasm; and if employed in excessive quantities, is liable to induce frantic and maniacal delirium, or sopor, and a condition resembling catalepsy. It would appear that the special effects which render it a favourite stimulant with the Eastern races are most perceptible in those who habitually accustom themselves to its use, similar to what occurs with opium eaters.

EXTRACTUM CANNABIS INDICÆ.—**Extract of Indian Hemp.**—Is of dark blackish-green colour, with rather fragrant narcotic odour, and warm bitterish taste; the dried herb yields about eight per cent. of extract. The purified resin, or cannabin, is a soft neutral substance, soluble in ether or alcohol, and precipitated by water.

Preparation.—Macerate Indian hemp, in coarse powder, lb. j., in rectified spirit, Oiv., for seven days; press out the tincture; distil off the spirit, and evaporate on a water bath to proper consistence.

Effects.—Considerable uncertainty attends the action of this remedy on different individuals: with some, small doses will operate powerfully, relieving pain, and inducing quiet sleep; for others it requires to be increased gradually, until it influences the system, and, as this necessitates constant watching, it is less serviceable in private practice than its admitted properties would lead us to hope. It has been given in tetanus and chorea, to allay inordinate muscular spasms; it sometimes acts as an hypnotic, and is less liable to induce headach or constipation, or to impair the appetite, than opiates, which has led to its use in chronic gouty and rheumatic attacks, neuralgic affections, and sciatica. I have known the pain of sciatica rapidly relieved by it; and yet in other cases, apparently equally favourable, it has failed completely.

Indian hemp has also been given for the nervous irritability and depression induced by dram drinking, and by the habitual use of opium, and to induce sleep when opiates are not desirable; in small repeated doses, it exerts some influence in restraining inordinate menstruation and uterine hæmorrhage, and occasionally gives relief in dysmenorrhœa. The strange hallucinations that result from using full doses of hemp are popularly known; the intoxication is usually of a pleasing character, though some are rendered quarrelsome, and almost maniacal, and in some the delirium that ensues is far from agreeable. Should it produce dangerous symptoms, the same treatment must be employed as in poisoning by opium.

Dose.—From half a grain to a grain and a half is generally considered a full dose in the East. We usually commence with about gr. ss., gradually increasing it, if necessary, to gr. iij. or gr. v.; in cases of tetanus it has been exhibited in augmenting doses, until gr. xx. were taken.

TINCTURA CANNABIS INDICÆ.—Tincture of Indian Hemp.—As the resin precipitates when this tincture is added to water, it should be given in emulsion, dropped on sugar, or suspended with a little aromatic spirit of ammonia.

Dose.—To check uterine hæmorrhage, gtt. v. to gtt. xv. are directed, every hour or two; as an anodyne, from gtt. x. to fʒj. are used, repeated every three or four hours until it gives relief.

Preparation.—Extract of Indian hemp, ℥j.; rectified spirit, Oj. Dissolve.

HUMULUS LUPULUS.—The Hop.—The cultivated hop is extensively grown in the south of England, where it is propagated from its root-sets, and comes into full bearing three years after being planted; its strobiles are picked in September, and carefully dried in kilns. The hop strobile, or catkin, consists of several thin papery scales, or bracts, of greyish-yellow colour, marked by veins, and aggregated into dense heads, each bract having at its base a small achene, with numerous minute yellow glands of lupuline, and covered by a membranous sepal. Lupuline constitutes about one-sixth of the weight of the hops, and on it the bitterness, aroma, and narcotic properties depend; it can be separated by using a fine sieve, and appears as a yellow powder; it affords two per cent. of volatile oil, and nearly fifty per cent. of yellow resin, with lignin, gum, and saline matters.

Botany.—Root perennial; stems annual, slender and rough, climbing from right to left; leaves petiolate, three to five-lobed, scabrous; flowers greenish-yellow, males chiefly on separate plants, females in dense strobiles of membranous bracts, each with an axillary flower; sepal membranous, persistent, covering the ovary; achene with a spirally-coiled embryo, exalbuminous.

Effects.—A pillow stuffed with hops is considered anodyne, and occasionally used to induce sleep in nervous affections and the restlessness of old age. Lupuline is prescribed as a narcotic and sedative, and specially recommended to relieve chordee; the infusion and tincture of hop are simple bitters.

Dose.—Of lupuline, five to ten grains.

EXTRACTUM LUPULI.—**Extract of Hop.**—This extract, sometimes termed humuline, is tonic.

Dose.—From gr. v. to gr. xx.

Preparation.—Hop, lb. j.; rectified spirit, Ojss.; macerate for seven days; press out the tincture; filter, and distil off the spirit, leaving a soft extract; boil the residual hop with distilled water, one gallon, for an hour; express the liquor; strain, and evaporate by a water bath to the consistence of a soft extract. Mix the two extracts, and evaporate, at a heat not above 140°, to a proper consistence.

INFUSUM LUPULI.—**Infusion of Hop.**—A tonic bitter.

Dose.—f℥ss. to f℥ij.

Preparation.—Hop, ℥ss.; boiling distilled water, f℥x. Infuse for two hours in a covered vessel, and strain.

TINCTURA LUPULI.—**Tincture of Hop.**—A mild bitter, with little or no narcotic properties.

Dose.—fʒj. to fʒij., usually given with the infusion.

Preparation.—Hop, ℥ijss.; proof spirit, Oj.; prepared by maceration and percolation, like tincture of aconite; to yield Oj.

ULMUS CAMPESTRIS.—**Common Elm.**—The liber, or inner bark of the elm, should be stripped from the tree in spring, and dried after removing the external portion; it consists of tough thin brownish-yellow pieces, odourless, and having a mucilaginous bitter taste, containing some tannin.

Effects.—A decoction made by boiling elm bark, ℥ijss., with water, Ojss. down to Oj., is used in treating chronic cutaneous diseases, being considered tonic and slightly diaphoretic; it is chiefly of use as a vehicle for other remedies; the dose is f℥j. to f℥iv., three or four times in the day.

Botany.—A large tree, with rough bark (distinguishing it from *U. glabra*); leaves ovate acuminate, oblique at the base, rough, and doubly serrated; flowers perfect; perianth bell-shaped, persistent; stamens five; styles two; fruit a samara, with broad membranous wing; seeds pendulous.

MORUS NIGRA.—**The Mulberry.**—The fruit or sorosis of the mulberry consists of numerous adherent female flowers; each becoming fleshy, and covering over a dry membranous pericarp; when ripe they are of deep purple colour, with an agreeable odour, and subacid juice, which contains tartaric acid, saccharine, and colouring matter. The juice of the mulberry is used in syrup for its colour and flavour.

Botany.—A small tree, occasionally cultivated in our gardens; leaves cordate, often lobed, rough and thickish; flowers monœcious; males in spikes; perianth four-lobed; stamens four; females in ovate catkins; fruit a purple sorosis; embryo in fleshy albumen.

SYRUPUS MORI.—**Syrup of Mulberry.**—Used for flavouring mixtures; it should not be added to alkaline solutions.

Dose.—fʒj. to fʒij.

Preparation.—Mulberry juice, Oj.; refined sugar, lb. ij.; dissolve with gentle heat; set aside for twenty-four hours; remove the scum; pour off the clear liquid from the dregs, if any; lastly, add rectified spirit, f℥ijss. The product should weigh lb. iij. ℥vj., of sp. gr. 1·330. (To measure Oij.; f℥ss.)

FICUS CARICA.—**The Fig.**—The finest figs are brought from Smyrna, packed in drums and baskets; they are gathered when almost ripe, and dried in the sun. A fig consists of a fleshy hollow receptacle, containing numerous small achenes, each the produce of separate female flowers; the juice is acrid and milky when immature, becoming replaced with sugar and mucilage after ripening.

Effects.—Figs are mildly laxative; they are employed in confection of senna.

Botany.—A small tree; leaves palmate, scabrous; flowers enclosed in a concave fleshy receptacle, having a small orifice at the apex, and a few scales at base; males near the aperture, perianth three-lobed; stamens three; females, perianth five-parted; drupe one-seeded, fragile.

Cupuliferæ.—Trees, or shrubs; leaves simple, stipulate, often feather-veined, males in catkins; stamens five to twenty; fertile flowers, aggregated on a spike; ovary many-celled, within a capsule or involucre; fruit a glans; seed solitary, exalbuminous.

QUERCUS PEDUNCULATA.—**British Oak.**—Two distinct varieties of this oak are recognised, both probably of equal value for medical purposes: *Q: pedunculata*, bearing its fruit on long stalks; and *Q: sessiliflora*, the Durmast oak, having sessile fruit, and coarse medullary rays. The bark of the young branches, gathered in spring, when most astringent, and easily removed from the wood, is officinal; it consists of fibrous reddish pieces, covered with grey shining epiderm, inodorous, and yielding fifteen to twenty per cent. of tannin, with a little gallic acid. It is used for preparing the decoction.

Botany.—A large tree; leaves deciduous, oblong ovate, deeply sinuated; flowers monœcious; males in lax catkins; females in a cup-shaped involucre; ovary three-celled, forming a one-seeded nut.

DECOCTUM QUERCUS.—Decoction of Oak.—Is principally used for vaginal injections, in cases of leucorrhœa; and for gargles in relaxation of the throat; it can also be employed in the treatment of chronic mucous discharges, and hæmorrhages from the bowels; its properties depend on the tannin which it contains.

Dose.—From f℥ss. to f℥ij., every three or four hours.

Preparation.—Oak bark, bruised, ℥jss.; distilled water, Ojss. Boil for ten minutes in a covered vessel, and strain.

QUERCUS INFECTORIA.—The Gall Oak.—This oak is a small shrub, which grows in Asia Minor and Persia; the galls are produced by an insect, the *Diplolepis gallæ-tinctoriæ*, depositing its ova, together with an acrid fluid, inside the young buds, stems, and capsules, which then acquire an abnormal development. A similar growth has made its appearance for some years past on our British oak, caused by an allied insect, the *Cynips Kollari*; they are somewhat smoother on their outer surface, and are worthless for medical purposes.

The finest gall nuts are of small size, ranging from the bulk of a pea to that of a marble; they are termed in commerce blue or green galls from their colour, and contain the young partially developed insect within a central cavity; when this makes its escape, the galls have a round perforation, acquire a pale yellow tint, and are lighter and less valued, though of larger size. The best galls contain two-thirds of their weight of tannic acid, and about two per cent. of gallic acid (Guibourt).

Botany.—A small tree or shrub, four to six feet high; leaves on short petioles, ovate oblong, sinuate, dentate, deciduous; acorn solitary, obtuse, two or three times the length of its capsule.

Effects.—Equal parts of powdered galls and alum, tied in a muslin bag, are recommended to be used as a pessary in the early stages of prolapsus uteri; galls are also used in ointment for hæmorrhoids; for internal employment tannin may be advantageously substituted for them.

TINCTURA GALLÆ.—**Tincture of Galls.**—Is seldom employed unless for testing persalts of iron, with which it strikes a bluish-black colour.

Preparation.—Galls, bruised, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, similar to tincture of aconite; to yield Oj.

UNGUENTUM GALLÆ.—**Ointment of Galls.**—Used for inflamed piles, which, after being well covered with ointment, should, if possible, be replaced within the sphincter.

Preparation.—Powdered galls, gr. lxxx.; simple ointment, ℥j. Mix.

UNGUENTUM GALLÆ CUM OPIO.—**Ointment of Galls and Opium.**—Used in the same manner as the simple ointment; but an ointment of tannin with morphia or extract of belladonna is preferable to this compound, which is seldom free from grittiness.

Preparation.—Gall ointment, ʒj.; powdered opium, gr. xxxij. Mix.

ACIDUM TANNICUM.—**Tannic Acid** ($C_{54}H_{22}O_{34}$).—The astringent principle that is so universally distributed through the vegetable kingdom exists in different interesting modifications, possibly having somewhat different ultimate constituents; its most important varieties are ordinary oak or gallo-tannic acid, and quinotannin, obtained from the cinchonas, which strike a bluish-black colour with persalts of iron; mimo-tannin, got in catechu and kino, which affords a dark green precipitate with iron persalts; and a third substance, contained in a few plants, such as rhatany and the common nettle, that produces a grey compound when added to any of these iron persalts. Oak tannin is isolated for medical use; it is amorphous, pale yellow, light and spongy, intensely astringent, and not prone to alter when in a dry state, but slowly converted into gallic acid in solutions, from absorbing oxygen; this change becomes accelerated by the presence of a peculiar ferment in the gall nut, as when powdered galls are exposed to the air in a moist state, or are boiled for some time with a dilute mineral acid, the tannin decomposes into glucose and gallic acid. Tannin will dissolve freely in water, spirit of wine, or glycerine; it is insoluble in ether; it precipitates with solution of gelatine, which forms a distinctive test of its presence, and when heated to 620° affords pyrogallic and metagallic acids.

Preparation.—Mix ether, Oiij.; distilled water, f℥v.; and pass in successive portions through galls in coarse powder, ʒviij., packed in a glass or porcelain percolator, so arranged as to prevent loss of the ether from evaporation. The liquid in the receiver consists of two strata: separate the heavier liquid; evaporate to dryness in a water bath, and complete the drying in a hot air chamber, the temperature of which does not exceed 212°; the ether may be recovered from the light liquid by distillation.

This is the process of Pelouze, and yields a satisfactory result. Commercial ether always contains a little spirit, which promotes the solution of the tannin in the lower layer of fluid, which consists of both spirit and water.

Effects.—When tannin is administered internally, it can be detected in the urine, in the form of gallic and pyrogallic acids, and will therefore operate directly in arresting hæmorrhage from the urinary passages. It acts as a powerful astringent in cases of chronic diarrhœa, and exerts a decided influence in restraining excessive pulmonary secretion in phthisis and bronchitic affections; it will also relieve colliquative sweating, and is a valuable remedy for checking hæmorrhages from the lungs, intestines, or uterus, though less relied on than gallic acid. For local purposes it is used dissolved in glycerine or water; the solution in glycerine will rapidly heal fissures of the nipple, and is an excellent application in diseases of mucous surfaces requiring an astringent, as elongated uvula, chronic inflammation of the fauces, and the ulceration of the gums and cheek from excessive salivation. In weak lotions, containing gr. ij. to gr. vi. in f℥j., it is used to diminish the discharge from cancerous and other ulcers, and as an injection for leucorrhœa and vaginal relaxation; it is also considered a useful remedy in cases of gleet and gonorrhœa, in fact, for all affections where a direct and energetic vegetable astringent is indicated. I have used it in ointment with much advantage for chronic eczematous and impeteginous eruptions, and as a substitute for gall ointment in hæmorrhoids. As a reagent, tannin is employed to precipitate gelatine from solutions, and to test the persalts of iron, with which it produces a bluish-black colour.

Dose.—From gr. iij. to gr. x., taken three or four times in the day.

SUPPOSITORIA ACIDI TANNICI.—Tannin Suppositories.—Are used to check colliquative and chronic diarrhœas; each contains gr. ij. of tannin; for this class of preparations cacao butter is a good vehicle.

Preparation.—Melt lard, gr. lxxx.; white wax, gr. xl., in a water bath; when nearly cold, add tannin, gr. xxiv., mixed with glycerine, twenty minims; when solidified, divide into twelve equal portions, and form into cones; when sufficiently firm, dip each cone in a mixture of wax three parts, lard eight parts, melted on a water bath, and set aside, that the coating may harden.

TROCHISCI ACIDI TANNICI.—Tannin Lozenges.—Employed in relaxed sore throat, and slight attacks of diarrhœa; each lozenge contains gr. ss. of tannin.

Preparation.—Tannin, 360 grains; boiling distilled water, f℥j.; dissolve; add this to tincture of tolu, f℥ss., mixed with mucilage of gum arabic, f℥ij., and then with powdered refined sugar, ℥xxv., powdered gum arabic, ℥j., and form into a proper mass. Divide into 720 lozenges, and dry them in a hot air chamber with moderate heat.

ACIDUM GALLICUM.—Gallic Acid ($3HO, C_{14}H_3O_7+2HO$).—This acid exists in small quantity in substances which contain tannin; it is readily formed by the oxidation of that principle on exposing powdered galls, moistened with water, to the air; it consists of brilliant white or fawn-coloured needles, or small oblique rhombic prisms, having a peculiar sweetish styptic taste; soluble in 100 parts of cold, or three of boiling water, and freely dissolved by spirit or ether; it strikes a deep black colour with mixed proto- and persalts of iron, and is distinguished from tannin by not precipitating gelatine; if dried at 212°, it loses water, and at about 410° sublimes, forming pyrogallic acid.

Preparation.—Place galls, lb. j., in coarse powder, in a porcelain dish; add distilled water to form a thick paste, and keep them in this moistened state for six weeks at a temperature between 60° and 70°, adding distilled water from time to time to supply the loss by evaporation; at the end of that time boil the paste for twenty minutes with f℥xlv. of the water; strain through calico, and when the fluid has cooled collect on a filter the crystalline deposit which has formed, and let it drain; press it strongly between folds of filtering paper, and redissolve in boiling distilled water, f℥x. When the fluid has cooled to 60°, pour it off from the crystals which have formed; wash these with ice-cold distilled water, f℥iij., and dry them, first by filtering paper, and finally at a temperature not exceeding 212°. By boiling the undissolved portion of the galls with f℥xlv. additional of water, filtering into a capsule containing the liquor decanted from the crystals in the preceding process, evaporating to f℥x., and cooling to 80°, an additional quantity of acid may be got, usually a little darker in colour than the product of the previous crystallization.

The conversion of gallotannic acid into gallic acid and glucose, by combining with the elements of water, affords the following reaction:—$C_{54}H_{22}O_{34} + 10\,HO = 3\,(3\,HO, C_{14}H_3O_7) + C_{12}H_{12}O_{12} + 2\,HO$. In the officinal process a kind of fermentation ensues; the mass becomes mouldy, absorbs oxygen, and evolves carbonic acid, but the intermediate stages which take place are not fully understood. When all the tannin is changed into gallic acid, it is dissolved out by boiling water, and purified by being recrystallized.

Effects.—Gallic acid is inferior to tannin in astringence, and less useful in the treatment of diarrhœa; it is much more valuable for hæmorrhages, and exerts a peculiar and direct influence over hæmaturia, being speedily recognisable in the urine after it is taken; it is best suited for passive bleedings from the kidneys and bladder; it will also control hæmorrhage from the stomach and bowels, and Professor Simpson and others have found it of decided service in cases of severe menorrhagia; in hæmoptysis depending on tubercular pulmonary disease, a combination of gallic and dilute sulphuric acids in mixture often succeeds in checking the loss of blood, though, like all other similar remedies in these attacks, it too often disappoints our hopes. In chronic desquamative nephritis, and in fatty degeneration of the kidneys, gallic acid is productive of much benefit, controlling the secretion of urine, and diminishing the loss of albumen. I have also found it to decrease the quantity of expectoration in several cases of phthisis and of abscess of the lung; a remarkable effect is sometimes produced by it, the expectoration becoming of a dark inky colour so long as it is continued. Its use is contra-indicated when there are any obvious symptoms of local irritation or febrile disturbance.

DOSE.—Usually gr. iij. to gr. x., best exhibited in solution, and repeated every hour or so if necessary; upwards of gr. lx. have been given for a dose.

GYMNOSPERMOUS EXOGENS.

CONIFERÆ.—Plants, abounding in turpentine, with glandular woody tissue; leaves usually acerose; flowers unisexual; males in catkins, monandrous or monadelphous; females in cones, sometimes solitary; ovules naked; embryo with oily albumen, and two or many verticillate cotyledons. The suborders are:—

ABIETINEÆ.—Fertile flowers, in cones, with one or two inverted ovules at base of each scale.

Scales with a thickened apophysis; leaves two to five, in bundles, PINUS.
„ without do. } . . . . { leaves flat, solitary, ABIES.
„ do. do. } . . . . { leaves tetragonous, solitary, PICEÆ.
„ do. do. } . . . . { leaves fascicled, LARIX.

CUPRESSINEÆ.—Ovules erect; fruit an indurated cone or galbulus, JUNIPERUS.

TURPENTINE.—Is the exudation of different trees of the above order: the chief commercial varieties are—

THUS AMERICANUM.—COMMON FRANKINCENSE.—Or American turpentine, principally obtained from the Southern States; it is got by incising the stems of *Pinus tæda* and *P: palustris*, and removing the bark for some distance above the part, so as to leave an aperture in which the turpentine collects as it exudes, and from this it is removed at intervals during the summer season; it is a yellowish-white, opaque, solid, becoming semifluid in warm weather, having an aromatic odour, and bitter pungent taste; as imported in casks, it usually contains different impurities of leaves, twigs, and insects, and requires to be remelted and strained; when distilled, it produces about seventeen per cent. of oil of turpentine, which has the property of right-handed polarization with a ray of light.

Bordeaux Turpentine.—Is got from *Pinus pinaster*, by a similar process of incising the stem; it is white, thick, and turbid, with a disagreeable odour, and acrid nauseous taste; it separates on resting into a thin yellow transparent liquid, and a granular honey-like portion; it is distinguished by becoming solid when mixed with magnesia, like Canada balsam.

Venice Turpentine.— Should be an exudation from the trunk of the *Larix Europea;* it forms a thick yellowish-green fluid, usually clouded; with peculiar odour, and acrid bitter taste; when kept, it has little or no tendency to become solid; the turpentine distilled from it has left-handed polarizing properties. A factitious substance, made by melting turpentine and palm oil, is usually sold instead of it.

Terebinthina Canadensis.—Balsam of Canada is procured by breaking the branches of the *Abies balsamea ;* it is transparent and pale yellow, of the consistence of honey, with peculiar agreeable odour, and tastes bitter and slightly acrid; it solidifies with age, or by exposure to the air; this turpentine is officinal; if unadulterated, it should solidify with one-sixth its weight of magnesia. It is used as a varnish, diluted with oil of turpentine; and occasionally given internally for gleet and gonorrhœa in emulsion, similar to copaiba.

Pix Burgundica.—Burgundy pitch is described as a resinous exudation of the stem of *Abies excelsa*, melted and strained; imported from Switzerland. It is a hard opaque brittle resin, varying in colour from whitish-yellow to dull reddish-brown, with rather fragrant odour, and aromatic taste, free from bitterness; when heated, it should give off no water; much of the substance sold in the shops is a mixture of common turpentine melted with palm oil.

EMPLASTRUM PICIS.—Pitch Plaster.—A mild stimulant and rubefacient, applied over chronic rheumatic affections, and to the chest, in recent catarrhs, spread on leather or calico.

Preparation.—Common frankincense, ℥xiij.; Burgundy pitch, ℥xxvj.; resin, ℥ivss.; yellow wax, ℥ivss. Melt together; add expressed oil of nutmeg, ℥j.; olive oil, f℥ij.; water, f℥j., and, constantly stirring, evaporate to a proper consistence.

OLEUM TEREBINTHINÆ.—Oil of Turpentine.—Often termed spirit of turpentine, is got by distilling any of the various turpentines with water,—the residue left being common resin or colophony. To remove all traces of acid, or resinous matters, the oil should be rectified a second time over carbonate of potash. If pure, it is limpid, colourless, almost free from odour, tasting hot, and bitter; sp. gr. 0·86; it is sparingly soluble in spirit, freely dissolves sulphur and phosphorus, and is very inflammable, burning with a smoky flame. The turpentine of commerce consists of several isomeric hydrocarbons, $C_{20}H_{16}$, which act differently on polarized light; it boils at 320°, and when more highly heated in closed vessels, can be separated into some chemically-interesting modifications; in the air it oxidizes, forming resinous acids, and acquires its well known ordinary odour; uniting with four to six atoms of water, it affords crystalline hydrates, and slowly absorbs dry muriatic gas, being converted into solid crystals $C_{20}H_{16}$, HCl, termed artificial camphor, and a liquid compound of similar composition, separable from each other at a freezing temperature by pressure.

Effects.—Large doses of the oil of turpentine will cause gastric heat, nausea, and vertigo, with symptoms of intoxication, generally followed by brisk catharsis; in moderate doses, especially if often repeated, or when its vapour is inhaled, it may induce hæmaturia and strangury, with febrile disturbance and purging; or, by becoming absorbed, will stimulate the kidneys to increased secretion, impart an odour of violets to the urine, and perceptibly affect the breath.

The medical uses of turpentine are numerous and important. When fʒss. to fʒj. is given, it acts as a valuable stimulant in continued fevers, low forms of peritoneal inflammation, and the advanced stages of catarrh, attended with excessive expectoration; it is also employed to relieve colic and flatulent distention of the bowels, and added to castor oil when an active warm purgative is indicated; such a combination is particularly useful in those engorgements of the liver that depend on cardiac or pulmonary obstructive diseases, and for threatened enteric attacks after delivery. As a vermifuge, full doses of turpentine are an effectual means of expelling tæniæ or ascarides, though from its unpleasant taste other remedies, as cusso or fern oil, are preferred in most instances. In atonic hæmorrhages from the mucous membranes, as the bowels or kidneys, it is prescribed in small repeated doses with the best results, and some practitioners recommend it given in this manner for purpura, whilst others prefer much larger quantities, as f℥ss. to f℥j. at longer intervals, relying on its purgative action; in the hæmoptysis depending on tubercular deposits in the lungs, it occasionally arrests the flow of blood, and is best suited for atonic cases with little febrile disturbance. Another important use of turpentine is for treating chronic mucous discharges; in gleet and gonorrhœa it is given combined with copaiba, or as a substitute for it, in doses of gtt. x. to gtt. xxx., thrice daily; in some forms of advanced dysentery with ulcerations of the intestines, it proves useful in small and repeated quantities made into emulsion; and also in the latter stages of typhoid fever, in which it has been supposed to exert a special alterative influence in healing the ulcerated intestinal glands that are characteristic of that disease. Prescribed with decoction of bark, it enjoys the reputation of being considered almost a specific for gonorrhœal rheumatism, and frequently gives relief in lumbago, sciatica, and other chronic neuralgic affections.

In tympanitic distention of the stomach and bowels there is no remedy more to be relied on than oil of turpentine, given by the mouth or in enema; it is invaluable in those rapid attacks which occur in the course of continued fevers, and for the acute tympanitis that sometimes follows delivery.

When exhibited in enema, oil of turpentine ought always to be made into a perfect emulsion with yolk of egg or some mucilaginous fluid, which will prevent its causing excessive local irritation; for this purpose, fʒij. to f℥j., or upwards, may be added to Oj. of fluid. It relieves tympanitic distention of the bowels, and colic, and is of service in obstinate constipation and other cases requiring stimulating injections. Used externally, it enters into rubefacient liniments for rheumatic affections, sore throats, old sprains, &c. Individuals will vary greatly in the tolerance they display of its topical irritating action; and should it excite extreme pain, friction with olive oil is our best application to the part. Sprinkled on flannel, it is an effectual and rapid irritant, much relied on in congestive pulmonary attacks, inflammatory abdominal diseases, as peritonitis or dysentery, and to relieve painful affections generally; when a more decided action is required, the oil is sprinkled on cloths wrung out of hot water and used for stuping. In ointment, it promotes the granulation of foul ulcers, bed sores, and sloughing parts, and is considered by those who have had extensive opportunities of judging, one of the most successful remedies for recent burns when attended with severe constitutional depression,—a treatment originally advocated by Dr. Kentish. Though seldom used by the surgeon, turpentine enjoys a deserved popular fame for arresting the hæmorrhage from recent incised wounds.

Dose.—When given as an anthelmintic to adults, f℥ss. to f℥jss.: for children, fʒj. to f℥ss., according to their age; as a stimulant, and to expel flatus, from fʒss. to fʒij.; for checking hæmorrhages and chronic mucous discharges, gtt. vj. to fʒss., repeated every three or four hours. It may be given on some aromatic water, with a little tincture of capsicum; or made into emulsion, for this purpose it requires an equal quantity of mucilage, or the yolk of an egg will suspend f℥j. of the oil.

CONFECTIO TEREBINTHINÆ.—Confection of Turpentine.—This is readily miscible with water, but is nauseous and unpleasant when used undiluted; it can be employed to prepare enemas extemporaneously.

Dose.—A teaspoonful or two, to relieve flatulence.

Preparation.—Oil of turpentine, f℥j.; liquorice root, in powder, ℥j. Mix, and add clarified honey, f℥ij.

ENEMA TEREBINTHINÆ.—Enema of Turpentine.—Used to relieve constipation, colic, and tympany. Turpentine is also frequently added to ordinary purgative enemas, suspended with yolk of egg.

Preparation.—Oil of turpentine, f℥j.; mucilage of starch, f℥xv. Mix.

LINIMENTUM TEREBINTHINÆ.—Liniment of Turpentine.—Introduced by Dr. Kentish, for treating scalds and burns; they are bathed with oil of turpentine or spirit of camphor, and then covered with lint dipped in the liniment.

Preparation.—Ointment of resin, ℥viij.; melt; gradually add oil of turpentine, f℥v.; and stir, to form an uniform liniment.

LINIMENTUM TEREBINTHINÆ ACETICUM.—Liniment of Turpentine and Acetic Acid.—A powerful rubefacient, recommended some years since by Dr. Barlow for cases of incipient phthisis, rubbed to the chest every night, until the skin becomes tender.

Preparation.—Oil of turpentine, acetic acid, liniment of camphor, of each, f℥j. Mix.

UNGUENTUM TEREBINTHINÆ. — Turpentine Ointment.—This is similar in its effects to the liniment, or to resin ointment, and may be used for the same purposes.

Preparation.—Oil of turpentine, f℥j.; resin, in coarse powder, gr. lx.; yellow wax, ℥ss.; prepared lard, ℥ss. Melt with a steam or water bath; remove and stir the mixture, until it solidifies.

RESINA.—Resin.—Is the residue obtained by distilling the turpentine which exudes from different coniferous trees, particularly of the genera *Pinus* and *Abies;* it is described to be translucent, semi-opaque, and yellowish, with a shining fracture; its odour and taste are faintly terebinthinate; this substance is got by distilling with gentle heat, and is either opaque when it contains a little water, or transparent if exposed to continued heat, which expels the watery part. If the process is carried on at a higher temperature, the dark brown-coloured colophony is procured. Resin consists chiefly of two isomeric acids, termed pinic and sylvic, $HO, C_{40}H_{29}O_3$: pinic acid dissolves in cold alcohol of sp. gr. 0·87, and is left on evaporating as an amorphous mass; sylvic acid can be got in crystals from hot alcohol, forming colourless rhombic prisms; common resin dissolves completely with alkaline fluids, and is largely used for preparing yellow soap; in medicine it is added to plasters for its adhesive and slightly stimulating properties.

EMPLASTRUM RESINÆ.—Resin Plaster.—This constitutes the old diachylon, or adhesive plaster, which is used, spread on calico, to maintain the apposition of recent wounds, and for strapping ulcers.

Preparation.—Litharge plaster, lb. ij.; melt with gentle heat; add resin, ℥iv.; hard soap, ʒij.; each powdered and previously liquefied. Mix thoroughly.

UNGUENTUM RESINÆ.—Resin Ointment.—Or basilicon; is much employed for dressing indolent ulcers that require stimulation, and for suppurating blisters, chilblains, and burns.

Preparation.—Resin, in coarse powder, ℥viij.; yellow wax, ℥iv.; simple ointment, ℥xvj. Melt with gentle heat; strain through flannel, and stir constantly till cool.

PIX LIQUIDA.—Tar.—Is a dark brown viscid fluid, with strong aromatic and peculiar odour; for medical use, that which is distinguished as Stockholm tar should be preferred; it is the produce of a rude distillation of the roots and wood of *Pinus sylvestris*, which are placed in a cavity in the side of a hill, and ignited; the kiln is then covered over incompletely with turf, and the tar distils off during the smouldering combustion through an aperture at one side of the pit, and is received into barrels. The composition of the distilled products varies considerably, according to the temperature of the process. The tar consists of several hydrocarbons, and a number of oxidized compounds, including creasote, resin, paraffin, acetic acid, naphthalin, and oil of turpentine.

Uses.—Though officinal, no preparations are made from tar, and it is gradually falling into disuse; it once bore a high reputation, when formed into ointment, for treating chronic cutaneous eruptions, and is still sometimes employed for psoriasis. Tar water, made by stirring a pint of tar in a gallon of water, was supposed to possess great efficacy in cases of chronic catarrh, and tubercular disease of the lungs.

JUNIPERUS COMMUNIS.—The Juniper.—Is a bushy evergreen shrub, or small tree, growing on dry barren hills in northern latitudes; its flowers appear in May, the berries ripening in the following summer; they are about the size of a pea, dark-purple, with a bluish bloom, marked by three radiating grooves above, and beneath are three small bracts; they contain a spongy aromatic pulp, and three hard angular seeds; and when distilled, afford nearly one per cent. of volatile oil; they also contain resin, sugar, wax, and other vegetable substances.

Botany.—Leaves evergreen, glaucous above; three in a whorl, linear, longer than the fruit, sharp-pointed; flowers small, axillary; males throwing off much yellow pollen; females usually on a separate shrub; fruit, a galbulus, composed of adhering scales, become fleshy, enclosing three hard seeds.

OLEUM JUNIPERI.—**Oil of Juniper.**—Is isomeric in composition with oil of turpentine; it is directed to be procured by distilling the unripe fruit; but is usually got for commercial purposes from the recent tops of the plant as well; it is colourless, or pale green; sp. gr. 0·911, and perfectly soluble in rectified spirit; if left in contact with water, it gradually deposits a crystallized hydrate, $C_{20}H_{16}, 2HO$.

Adulteration.—Common juniper oil is often mixed with turpentine, and is not very soluble in rectified spirit; the wood and leaves are used in its preparation as well as the berries.

Effects.—Juniper berries are used in infusion to act on the kidneys in dropsical affections, and are fermented with rye in Holland for preparing Geneva or Hollands, which owes its flavour and diuretic properties to the oil of juniper in it. The oil of juniper is prescribed in doses of gtt. j. to gtt. vj., in pill, or dissolved in spirit, as a stimulating diuretic; it should not be employed when inflammatory symptoms are present.

SPIRITUS JUNIPERI.—**Spirit of Juniper.**—Usually added to other diuretics in mixture.

Dose.—Ten drops to fʒj.

Preparation.—English oil of juniper, f℥j.; rectified spirit, f℥ix. Dissolve.

HUILE DE CADE.—Is an empyreumatic oil, procured in France by the destructive distillation of the roots and stem of *Juniperus oxycedrus*, and much used in veterinary medicine; it is a thick tarry fluid, having a strong odour, and acrid caustic taste. This oil was introduced into practice as an unfailing remedy for obstinate squamous eruptions, and chronic cases of eczema and impetigo, it is used in the form of weak ointment, or the oil is gently rubbed over the affected surface with a little lint or cotton wool, and removed after a few minutes, leaving merely a thin layer behind; the friction is repeated at intervals until it excites some irritation; beyond its comparative novelty, it has little advantage over other terebinthinates, and such preparations as carbolic acid or creasote are preferable, from their definite composition.

JUNIPERUS SABINA.—Savin.—Is a compact and bushy shrub, that is frequently cultivated in gardens, and grows wild in Southern Europe, and over part of Asiatic Russia. The fresh and dried tops, gathered in spring from British-grown plants, are directed for medical use; they have a strong heavy odour, particularly when bruised, and an acrid bitter resinous taste; by drying they lose some of their aroma, which depends on the presence of an essential oil.

Botany.—A bushy dense shrub; branches slender, completely surrounded by the minute convex imbricated leaves, arranged in four rows; galbulus round, purple, somewhat smaller than the juniper berry.

OLEUM SABINÆ.—Oil of Savin.—Is procured by distilling the recent tops with water. It is colourless or pale yellow, and has the strong unpleasant odour, and acrid taste, distinctive of the plant; according to Kane, its sp. gr. is 0·915; it boils at 315°; and its composition is isomeric with oil of turpentine, like the English variety of which it rotates a ray of polarized light to the right.

Effects.—Savin is popularly reputed to have considerable influence in causing abortion, and fatal results occasionally follow its use when given with this intention; it induces violent abdominal pain, vomiting, and other symptoms of gastro-intestinal irritation; severe uterine hæmorrhage may ensue; and when it succeeds in inducing miscarriage, it is at the serious risk of the person's life. In cases that have terminated fatally, the uterine viscera and the kidneys have been found highly congested or inflamed; and fragments of the savin can be recognised by their peculiar odour, or by a microscopic examination of the contents of the intestines. In ointment, savin is used to keep blisters discharging; and applied to seton tapes, to increase their effect. The oil of savin acts as a valuable direct emmenagogue, being more certain than any other remedy of its class; when prescribed in small doses, as gtt. j., it is best given in the form of pill, with aloetic purgatives; but larger doses require to be prescribed made into an emulsion; from gtt. ij. to gtt. vj. have been given, three or four times in the day.

Antidotes.—In cases of poisoning with savin, it should be got rid of by emetics or using the stomach pump, and afterwards diluents and anodynes are required.

TINCTURA SABINÆ.—Tincture of Savin.—The dose will range from gtt. xx., to fʒj., taken three or four times in the day; it appears to be a useless formula when we have the essential oil of savin.

Preparation.—Savin, dried and bruised, ℥ijss.; proof spirit, Oj.; prepared by macerating and percolation, similar to tincture of aconite; to yield Oj.

UNGUENTUM SABINÆ.—Ointment of Savin.—When well made, this should be of fine green colour, and have a strong odour of the plant; it is generally used for increasing the discharge from blistered surfaces.

Preparation.—White wax, ℥iij.; prepared lard, ℥xvj.; melt on a water bath, and add fresh savin, bruised, ℥viij. Digest for twenty minutes; remove, and express through calico.

ENDOGENS (SUBCLASS DICTYOGENS).

Smilaceæ.—Shrubby, climbing plants; leaves petiolate, jointed to the stem; flowers hermaphrodite or unisexual; perianth six-parted; stamens six; ovary three-celled; ovules orthotropal; fruit a berry, with few or many seeds.

SARSA.—Jamaica Sarsaparilla.—The variety of sarsaparilla distinguished in commerce as Jamaica, though brought from central America, is the only officinal description; several other kinds are recognised and largely used, which are all derived from different species of *Smilax*.

The Red or Jamaica Sarsaparilla is the produce of the eastern coast of Honduras, and reaches the West Indies from ports in Columbia and Guatemala; it is ascribed to *Smilax officinalis*, which also abounds in New Grenada. The roots are brought folded into bundles, each from twelve to eighteen inches long by four or five broad, and again packed in large circular bales; the roots are long and slender, about the thickness of a quill, with numerous adherent rootlets or small fibres; the cortex is brown-coloured, or orange-red; when chewed it tastes mucilaginous and very slightly bitterish and acrid; it tinges the saliva, and yields a large quantity of extract of fine quality, amounting to nearly one-third the weight of the root employed; it is further distinguished by containing very little starch.

Lima Sarsaparilla is imported in bundles about three feet long and nine inches thick, consisting of the folded roots with the adhering rhizome, technically termed the "chump," wrapped up in their interior, and again repacked into bales weighing sixty to eighty pounds; the colour of the epiderm is brown, or greyish-brown; it resembles the Jamaica sarsaparilla in quality, but affords somewhat less proportion of solid extract; and is probably derived from a similar botanical source.

Brazilian or Lisbon Sarsaparilla is referred to *S: papyracea*, a native of the province of Rio Negro; it is brought from Para and Maranham, packed without folding in cylindrical bundles three to five feet in length by about a foot thick, closely bound together with a long flexible cane stem, and free from rhizome; it belongs to those sarsaparillas which are characterized by their inner cortical layer abounding in starch; it presents few longitudinal wrinkles or fibrous rootlets, and its decoction is much paler than that got from Jamaica sarsaparilla.

HONDURAS SARSAPARILLA is imported from different parts of the Bay of Honduras, in bundles consisting of the folded roots with rhizomes and adhering portions of the prickly stems, roughly repacked into bales, and bound together with hides, each containing 100 lbs., or upwards; the epiderm is dirty greyish or reddish-brown coloured; it has few rootlets, and the cortex abounds in starch, its decoction becoming blue when tincture of iodine is added; from three quarters to a pound weight of extract has been got from lb. v. of this root. Its source requires to be further investigated.

VERA CRUZ OR CARACCAS SARSAPARILLA is ascribed to the *S: syphilitica*, and, according to Scheide, is produced by *S: medica*, a native of the eastern slopes of the Mexican Andes; it is imported in large loose bales, bound with thongs of hide or cord; the roots are of pale reddish-grey colour, and contain a large quantity of starch.

All descriptions of sarsaparilla are without odour; its decoction has a faint, peculiar smell, and the root is valued in proportion to the slight bitterness and acridity which it developes when chewed; the red colour of the cortex, the quantity of small rootlets that are present, the amount of extract which it produces, and the relatively small portion of starch found in the cortex, are all considered of service in determining its therapeutic goodness. It has been repeatedly analyzed; it contains a small quantity of volatile oil and resin, and a substance termed smilacin, which is white, crystalline, and almost tasteless; it is considered closely allied to saponin; its medical properties are not very obvious, and to it the remarkable frothing of the decoction is ascribed.

BOTANY.—S: OFFICINALIS.—A shrubby plant, with quadrangular prickly twining stem; leaves coriaceous, cordate acute, five to seven-nerved, a foot long, and four to five inches broad; petioles smooth, bearing two tendrils above their base; flowers and fruit unknown. This plant grows on the banks of the Magdalena, New Grenada.

S: PAPYRACEA.—Stem four-cornered, prickly; leaves elliptical, acuminate, with three prominent ribs, somewhat membranous. Found in the province of Rio Negro.

S: MEDICA.—Stem angular, armed with straight prickles; leaves five to seven-nerved, the inferior ones cordate, the upper cordate ovate; inflorescence an eight to twelve-flowered umbel; fruit red, like a small cherry, with two or three seeds. Abounds on the eastern slopes of the Mexican Andes.

EFFECTS.—As already mentioned, those varieties of sarsaparilla which contain the least quantity of starch and the most extract are preferred for medical use; some practitioners have much confidence in the alterative properties of this drug, and prescribe its preparations, frequently combined with alterative remedies, such as iodide of potassium, or dilute nitric acid, in secondary venereal and cutaneous eruptions, for syphilitic and chronic rheumatic pains, strumous diseases, and depraved conditions of the health generally. I cannot say that I have found it of any decided value; possibly, if the decoction was always given warm, and continued diaphoresis promoted during its employment, as used to be done when it was first introduced into practice, its claims would be more obvious. I have given sarsaparilla broth, prepared by boiling the decoction with a sufficient quantity of fresh beef or fowl, to cachectic individuals with much advantage; but a large share of the improvement must be ascribed to those nutritious additions.

DECOCTUM SARSÆ.—DECOCTION OF SARSAPARILLA.—By using the unsplit roots the separation of starch is greatly prevented, the extract being chiefly got in the cortex; long-continued boiling is also properly avoided in this formula. When decoction of sarsaparilla is made with the best Jamaica sarsaparilla, it gives little or no blue coloration with tincture of iodine.

DOSE.—f℥ij. to f℥viij. three or four times in the day.

PREPARATION.—Jamaica sarsaparilla, not split, ℥ijss.; boiling distilled water, Ojss. Digest for an hour; boil for ten minutes in a covered vessel; cool and strain; the product should measure Oj.

DECOCTUM SARSÆ COMPOSITUM.—COMPOUND DECOCTION OF SARSAPARILLA.—This is the old decoction of sweet woods; the additions which are made to it can add but little to the effects of the sarsaparilla root.

DOSE.—f℥ij. to f℥viij., three or four times in the day.

PREPARATION.—Jamaica sarsaparilla, not split, ℥ijss.; sassafras chips, guaiac wood turnings, fresh liquorice root, of each a quarter of an ounce; mezereon, gr. lx.; boiling distilled water, Ojss. Digest for an hour; boil for ten minutes in a covered vessel; cool, and strain; the product should measure Oj.

EXTRACTUM SARSÆ LIQUIDUM.—LIQUID EXTRACT OF SARSPARILLA.—When well made, this preparation should form a clear solution with water; and if rubbed on white paper, the reddish tint which Jamaica sarsaparilla produces is considered distinctive of it; inferior descriptions giving a duller brown colour. Each f℥j. represents fʒij. of sarsaparilla.

DOSE.—fʒss. to fʒij., thrice or four times in the day.

PREPARATION.—Jamaica sarsaparilla, not split, lb. j.; distilled water, at 160°, Ovij.; macerate for six hours, and decant the liquor; digest the residue in as much more water for the same time; express; filter the mixed liquids, and evaporate by a water bath to f℥vij., or until of sp. gr. 1·13; when cold, add rectified spirit, f℥j.; the sp. gr. should be about 1·095.

COMPOUND FLUID EXTRACT OF SARSPARILLA.—Preparations bearing this name are largely used as a convenient substitute for the bulky decoctions, and taken in doses of f℥j. to fʒiv., thrice daily, often diluted with water, or given with iodide of potassium, and other alteratives. The following is a good formula for making it:—

Preparation.—Solid extract of Jamaica sarsaparilla, ℥x.; liquorice, ʒvj.; dissolve in tepid water, Ojss.; add mucilage, Oj., and oil of sassafras, fʒss., dissolved in rectified spirit, f℥iij.

ENDOGENS (SUBCLASS PETALOIDEÆ).

Scitamineæ.—Tropical herbs, with rhizomes, simple sheathing leaves, the veins diverging from a midrib, and flowers rising from membranous spathes; perianth irregular, in three rows; calyx three-lobed; the corolla and staminodes each three-parted; stamens three, the two lateral abortive; capsule three-celled, many-seeded; embryo in a vitellus.

ZINGIBER OFFICINALE.—**Ginger.**—Is extensively cultivated in the Tropics, and imported from the East and West Indies, Africa, and Cochin China. The rhizomes are dug up after the stalks have withered, when they are about a year old, and dried by exposure to the sun's heat; they are in flattish, branched or palmated pieces, seldom exceeding three or four inches long, having an aromatic and pungent taste, and peculiar agreeable aroma. The best "uncoated" ginger is plump, pale yellowish-white, and when broken presents numerous pointed fibres, imbedded in mealy tissue; it should be easily cut, and has had all the epiderm carefully removed by scraping; this is the variety directed for officinal use. Much of the African ginger is covered by an adherent dry shrivelled epiderm of dark yellow colour; inferior varieties have a brownish or reddish tint; the pieces are thin, shrivelled, hard, and difficult to cut with a knife. The acrid principle of ginger is a pale yellow volatile oil, it also contains a soft aromatic resin of pungent flavour; with about one-fourth its weight of starch, some gum, and woody fibre.

Botany.—Rhizome tuberous and creeping, bi- or perennial, with annual stems, two or three feet high, enclosed in a membranous sheath of the leaves, which are lanceolate, smooth five to six inches long, and about an inch broad; flowers dingy-yellow, on radical spikes, formed of single-flowered imbricated bracts, lip dark purple; capsule three-celled, with numerous seeds.

ADULTERATIONS.—Powdered ginger is liable to serious adulteration with flour and starch; these additions are not easily detected unless by the microscope.

EFFECTS.—Ginger is employed for flavouring other remedies, and as a carminative to relieve flatulence and griping; its powder, mixed with linseed meal and water, may be applied, spread on linen, as a speedy rubefacient.

DOSE.—In powder, from gr. v. to gr. xx.

TINCTURA ZINGIBERIS.—TINCTURE OF GINGER.—Usually added to purgative or stimulant mixtures as a carminative. The ESSENCE OF GINGER which is sold is merely a concentrated tincture.

DOSE.—Twenty drops to fʒj.

PREPARATION.—Ginger, bruised, ℥ijss.; rectified spirit, Oj., prepared by maceration and percolation, similar to tincture of aconite; to yield Oj.

SYRUPUS ZINGIBERIS.—SYRUP OF GINGER.—A warm stomachic, used for flavouring draughts and mixtures.

DOSE.—fʒj. to fʒij.

PREPARATION.—Tincture of ginger, f℥j.; syrup, f℥vij. Mix.

CURCUMA LONGA.—TURMERIC.—Is largely cultivated in India and China for its rhizomes, which are used in cookery to prepare curry powders. It consists of round or elongated tubers, seldom exceeding two inches in length, of yellow colour externally, breaking with a waxy fracture, and of deeper reddish-brown inside; its taste and odour are aromatic and peculiar; when chewed, it tinges the saliva of bright yellow; its colouring matter, termed curcumin, has been obtained by acting on the alcoholic extract with ether—it is a brownish-yellow resinous substance.

USES.—Turmeric is officinal for preparing TURMERIC PAPER: this consists of sheets of unsized paper, soaked in tincture of turmeric, and dried by exposure to the air; it is employed in testing alkalies, which strike with it a brown colour, which in the case of ammonia or its carbonate soon passes off.

BOTANY.—Rhizome perennial, tuberous, deep yellow; leaves radical, large, sheathing; scape short, thick, forming a spike, composed of numerous imbricated bracteal scales; flowers dull yellow, three to five together.

TINCTURE OF TURMERIC.—Is used to prepare turmeric paper. When boracic acid is added to turmeric, it gives a brown coloration, but has no action on rhubarb; this is employed to test the presence of turmeric on the exterior of commercial rhubarb.

Preparation.—Bruised turmeric, ℥j.; proof spirit, f℥vj. Macerate for seven days, and strain.

ELETTARIA CARDAMOMUM.—The true Cardamom.—The Malabar cardamoms are obtained naturally or by cultivation; their growth is described by Mr. Markham as he has observed it on the western slopes of the Coorg Mountains; he states that in February a space is selected and cleared away around one of the largest forest trees, on a steep declivity, for a distance of forty feet broad by 100 in length; the tree is cut about twelve feet above the ground, and in its fall clears away additional space; within the course of three months the cardamom plants that are in the soil begin to appear, during the rains of the monsoon; the ground requires to be kept weeded at intervals, and after two years flowering branches are formed, and the fruit is gathered from them in the subsequent autumn; successive crops can be obtained for six or seven years, after which it is more profitable to make a fresh clearing.

The cardamom fruit is an ovate obtusely three-sided capsule, three to eight lines long and three or four thick, of pale yellowish-white colour and coriaceous consistence, containing numerous closely packed brown aromatic seeds, which are white internally, and have a warm agreeable taste; according to the size of the capsule they are distinguished in commerce into long, short, and medium growths; the aromatic flavour of the seeds is caused by the presence of a colourless volatile oil, of which they contain about four per cent.

Effects.—They are used as an agreeable and aromatic spice, free from acridity, for flavouring other medicines.

Botany.—Rhizome with numerous fleshy fibres; stems perennial, six to nine feet high; leaves large, lanceolate; scape horizontal, from the base of the stem; flowers in a panicle, each short-stalked; calyx tubular, permanent; corolla pale greenish, the inner lip much larger than the outer divisions, with purple violet stripes.

TINCTURA CARDAMOMI COMPOSITA.—Compound Tincture of Cardamoms.—A useful aromatic tincture for adding to purgative, tonic, or carminative mixtures.

Dose.—fʒss. to fʒij.

Preparation.—Cardamoms, caraway, of each, bruised, a quarter of an ounce; raisins, freed from their seeds, ℥ij.; cinnamon, bruised, ℥ss; cochineal, in powder, gr. lx.; proof spirit, Oj.; prepared by macerating and percolation, similar to tincture of aconite; to yield Oj.

Marantaceæ are distinguished from **Scitamineæ** by the absence of aroma, and by one of the lateral stamens alone being fertile, with a petaloid filament, which bears a one-celled anther; embryo without vitellus.

MARANTA ARUNDINACEA.—**The Arrowroot Plant.**—This species of maranta and others closely allied to it are cultivated in the Tropics, particularly in the East and West Indies, for preparing arrowroot. The starch, or fecula, is obtained from the white tubers of the rhizome when about a year old; after being washed, they are beaten into pulp, mixed with a large quantity of water in a tub; and the starch which subsides in the bottom of the vessels, after straining through a sieve, is collected and dried in the sun. Good arrowroot should be perfectly free from odour or taste, consisting of numerous starch particles, varying from $\frac{1}{750}$th to $\frac{1}{2000}$th of an inch in their length, each having at one end a small hilum, or point of attachment to the vegetable cell, and surrounded by several finely marked rings; its composition is $C_{12}H_{10}O_{10}$, and its nutritive qualities are simply those of a pure and palatable starch: it presents no peculiar advantages over the fine substance prepared from maize which is now extensively sold as Indian corn flour, at a much more reasonable price.

Adulteration.—Arrowroot is liable to be mixed with different cheaper farinaceous substitutes, particularly potato starch; the particles of which are glistening, and of larger size, easily detected by inspection, or better still by the use of the microscope.

Botany.—Rhizome white, tuberous, with several scaly, curved shoots; stems, two or three feet high, herbaceous; leaves ovate lanceolate, with long sheaths; flowers white and small; corolla unequal; stamens petaloid; ovary three-celled; fruit dry, one-seeded.

Irideæ.—Perennial herbs, with bulbous, tuberous, or shortly creeping rhizomes; leaves equitant, flattened vertically; flowers with spathes; perianth superior, with six petaloid segments; stamens three, extrorse; ovary inferior, three-celled, with many ovules; style one, with three petaloid stigmas; capsule loculicidal; seeds with hard albumen.

CROCUS SATIVUS.—**Saffron Crocus.**—This is an Asiatic plant, which has long been cultivated in Europe; its flowers appear in September and October; they are collected in the morning, the stigmata and a portion of the styles carefully plucked out and dried, whilst the rest of the blossom is rejected. The best descriptions of **hay** saffron are imported from Spain and France; the separate deep orange coloured stigmata of which it consists are about an inch or an inch and a half long, notched, and expanded at the upper part, the lower portion being narrow, and of a paler yellow; its odour is agreeable and aromatic, and its taste slightly bitter, tinging the saliva of deep yellow colour. A variety termed cake saffron used to be prepared by pressing the stigmas together, which is still made in the East, but the little of it sold in these countries consists of safflower mixed with gum water, rolled into oval cakes. Saffron a small quantity of yellow volatile oil, gum, with woody fibre, and a colouring matter, termed polychroite, which constitutes nearly two-thirds of its weight; it yields its properties to water or rectified spirit, forming deep orange-coloured solutions. According to the observations of Pereira, it will require no less than between four and five thousand flowers to produce a single ounce of saffron.

Adulterations.—Its high price is an inducement to adulterate this substance: sometimes portions of saffron are mixed with it from which the colouring has been extracted, or fibres of beef, which are best detected by their appearance and smell when burned; safflower is also used, but is recognised by consisting of separate red florets, each monopetalous, tubular, and fine-toothed, and if rubbed on wet paper only causes a slight yellow stain.

Botany.—Corm roundish; leaves long, narrow, with a white midrib appearing as the flowers fade; these arise in autumn; the perianth is purple, tube long, six-parted; stamens three; style long, with three thick drooping orange stigmas, notched at the apex.

Effects.—Saffron was considered to be narcotic, sudorific, and emmenagogue; hence it is a constituent of the pilula aloes et myrrhæ, and is added to diaphoretic mixtures in treating the exanthemata, under the idea that it assists the appearance of the eruption. Its only positive use appears to be for imparting a yellow colour to mixtures, for which purpose a syrup of saffron is often used, though no longer officinal.

TINCTURA CROCI.—Tincture of Saffron.—Employed for colouring, and occasionally as an emmenagogue, in doses of fʒj. to fʒij.

Preparation.—Saffron, ℥j.; proof spirit, Oj.; prepared by macerating and percolation, similar to tincture of aconite; to yield Oj.

SYRUP OF SAFFRON.—Is used for colouring mixtures, in doses of fʒss. to fʒj.; it is not officinal.

Preparation.—Saffron, ℥ss.; boiling water, Oj. Infuse for twelve hours; strain, press, and dissolve in the clear liquid twice its weight of refined sugar.

IRIS FLORENTINA.—The Iris.—The rhizome of this plant has a fragrant violet odour; it is used for mixing with starch in the proportion of four to eight parts with one of iris powder, for preparing the ordinary violet or hair powder, used for dusting infants, and as a desiccating application in cutaneous diseases attended with excessive serous discharge, particularly cases of eczema and impetigo: the addition of about one-fourth or one-sixth of oxide of zinc materially increases its effects in drying up excoriations. It is not officinal.

LILIACEÆ.—Perennial herbs, rarely arborescent, with creeping, bulbous, or fibrous rootstocks; flowers hermaphrodite; perianth inferior, regular, and petaloid; stamens six; anthers opening inwards; ovary free, three-celled; style single, with a simple or three-lobed stigma; fruit a capsule or berry; seeds usually numerous.

ALOE.—ALOES.—The leaves of different species of these succulent plants are employed for preparing the medical aloes; they grow extensively in nearly all warm climates, and afford a resinous bitter juice, contained in parallel greenish-coloured vessels, situated beneath the epiderm, the inner portion of their tissue abounding in only a watery sap. Two varieties are officinal—Barbadoes and Socotrine aloes; but Cape aloes is greatly employed for ordinary purposes, and the kind termed hepatic aloes is well known in commerce.

ALOE BARBADENSIS.—BARBADOES ALOES.—Also termed caballine, from its extensive use in veterinary practice, is imported from Barbadoes, Jamaica, and other West Indian islands; usually contained in large-sized hollow gourds, or occasionally packed in boxes; its colour is dark liver-brown, or almost black; it breaks with a dull opaque fracture, and has a strong-smelling unpleasant odour, which distinguishes it from all other kinds; its powder is olive-yellow; it dissolves almost entirely in proof spirit, and during solution the microscope will show the presence of numerous crystals of aloin. This aloe is chiefly obtained from *A: vulgaris*, by cutting the leaves near the roots, collecting the juice which exudes, and evaporating it to a proper consistence with heat.

ALOE SOCOTRINA.—SOCOTRINE ALOES.—Is brought from the island of Socotra, and the neighbouring districts of Arabia, usually through Bombay, packed in skins or kegs; its consistence ranges from hard and fragile, to a semiliquid state; the fresh-broken pieces are garnet-red, and translucent on the edges, with smooth resinous surface, having a strong tan-like odour, that becomes more perceptible when it is breathed on or heated. The semiliquid description often throws down a large quantity of bright yellow crystallized aloin; and crystals of this substance are also easily perceived by a microscope during the solution of a fragment of the aloes in proof spirit; the powder has a bright reddish-yellow colour. This description of aloe is probably derived from *A: Socotrina*, which is described by Welsted as growing abundantly in all parts of the island; its juice is reported to be inspissated by spontaneous evapotion in the heat of the sun.

CAPE ALOES.—By far the commonest and cheapest kind is imported from the Cape of Good Hope, packed in skins and chests; it resembles common resin, having a bright shining greenish-black colour, and when broken its edges appear greenish-red to transmitted light; its odour is peculiarly sour-smelling and disagreeable, and its powder is greenish-yellow; it has occasionally been imported of dull liver-colour, but its odour will always sufficiently distinguish it. The leaves of several species of aloe appear to be used indiscriminately in its preparation; amongst others, *A: spicata*, *A: ferox*, and *A: Africana;* it is said that the juice which exudes from the cut leaves is permitted to drain into skins, then gathered, and boiled down with constant stirring, until reduced to a fit state for exportation.

HEPATIC ALOES.—Is reddish-brown, opaque, darker, and less glossy than the Socotrine; its fracture is less smooth, and it has a more unpleasant odour; it is brought packed in casks from Bombay, and often termed Indian aloes, but is supposed to be originally got from the coasts of the Red Sea; and there are reasons for believing its source is a species of aloe closely allied to, or identical with, the *A: Socotrina:* a portion of it is frequently insoluble in proof spirit, but dissolves in solution of potash, forming a red liquid.

COMPOSITION.—Messrs. T. and H. Smith, of Edinburgh, have obtained from several varieties of aloe, particularly Barbadoes and Socotrine, the interesting principle termed aloin; this is got by exhausting powdered aloes with cold water, evaporating the infusion *in vacuo* to a syrupy consistence, and allowing the residue to rest in a cool place. After two or three days, a brownish-yellow granular mass of minute crystals is deposited, which is pressed in bibulous paper, and repeatedly crystallized from hot water not exceeding 150°, as aloin rapidly oxidizes at the boiling point; by dissolving it in dilute alcohol, and cooling, it is got in small needle-shaped crystals; it is a pale yellow, intensely bitter, free from odour, readily soluble in alkaline solutions, or in sixty parts of cold water, and insoluble in ether or chloroform; at 212° it becomes altered, melts at 300°, and burns with a smoky flame; its composition, is reported by Stenhouse, to be $C_{34}H_{18}O_{14}$. According to different statements, the amount obtained from aloes will range from ten to sixty per cent. Aloes also contain a principle termed aloesic acid; some vegetable albumen; and a resinous part which remains insoluble in water, and probably consists of oxidized extractive matter: the observations of Garrod have shown that its medical properties are trifling.

BOTANY.—Succulent plants, with fleshy leaves; flowers spiked, perianth tubular, six-cleft, fleshy, its segments imbricated; stamens hypogynous, as long as, or longer than the perianth; capsule membranous, three-celled, with numerous seeds.

A: **Vulgaris.**—Stem short and woody; leaves lanceolate, glaucous, with distant reddish spines; scape axillary, with a spike of yellow flowers, at first erect, then spreading, and afterwards pendulous. A native of the East and West Indies, Spain, Greece, and Barbary.

A: **Socotrina.**—Stem a foot and a half high; leaves curving inwards at the point, green, with numerous white serratures at their edges; flowers scarlet at the base, pale in the centre, and green above; stamens unequal, three, longer than the flowers. Inhabits Socotra and Africa.

A: **Spicata.**—Stem thick, three or four feet high; leaves large, distantly-toothed, having a few white spots; flowers bell-shaped, in long spikes, filled with purplish honey; the petals obtuse, white, marked by a triple green line. Is common at the Cape of Good Hope.

Effects.—Small doses of aloes can be employed, like other bitters, for tonic purposes, and have the additional advantage of being laxative. When full doses are given, they operate as a certain and effectual purgative, and there does not appear to be much appreciable difference between the various kinds in their action. Aloes will not usually operate upon the bowels for some hours after it has been taken, and from its bitter taste is best given in pills; it is considered to exert a special influence upon the large intestine, and indirectly upon the uterus; hence it is contra-indicated where there is a decided tendency to hæmorrhoids, though sometimes of service when it becomes necessary to promote the re-establishment of this discharge in persons of sedentary habits; and whilst aloetic preparations are in constant use as habitual purgatives during pregnancy, yet I have known abortion distinctly induced by them.

Aloes enters into the composition of all the ordinary purgative pill masses; it proves of special service in treating torpor of the intestines depending on deficiency of bile or of intestinal secretion, and for the habitually costive condition of the bowels which often occurs with females; it is also given in amenorrhœa connected with a chlorotic condition of the blood, combined with chalybeates, as dried sulphate of iron, and oil of savin, and seems in such cases to be of benefit perfectly independent of its purgative effects; its tendency to irritate the rectum is diminished by the addition of soap; and all resinous purgatives are rendered milder by melting the pill mass in which they are contained, and thus securing their perfect subdivision. In enema it is sometimes prescribed to expel ascarides from the rectum; and for amenorrhœa, administered at intervals about the period when the menses should appear.

Aloin is gradually coming into use as a substitute of definite strength for crude aloes; it is considered to possess similar properties, and operates as a mild but certain purgative.

Dose.—In doses of a quarter to half a grain, aloes is used as a tonic; five grains is the ordinary purgative dose, but ten to fifteen grains are given when required. Aloin is prescribed in doses of two to four grains.

EXTRACTUM ALOES BARBADENSIS.—Extract of Barbadoes Aloes.—The object of this process is to remove the resinoid portion of the aloes, which is supposed to irritate the bowels, but it appears to possess little or no effects, and there can be trifling advantage in extracting it; besides, the evaporation does not improve the quality of the product.

Dose.—From five to fifteen grains, given in pill.

Preparation.—Barbadoes aloes, in small fragments, lb. j.; boiling distilled water, one gallon. Stir well until thoroughly mixed; set aside for twelve hours; then pour off the clear liquor; strain the remainder, and evaporate the mixed liquors by a water bath or current of warm air to a proper consistence.

EXTRACTUM ALOES SOCOTRINÆ.—Extract of Socotrine Aloes.—Is used in the same doses as the last preparation, and appears equally unnecessary when we can obtain good aloes.

Preparation.—Made from Socotrine aloes, in a similar manner to the last described extract.

PILULA ALOES BARBADENSIS.—Pill of Barbadoes Aloes.—A useful purgative pill in habitual constipation, and for all cases where an active cathartic is required. The Barbadoes aloes is considered by many to be more powerful than other descriptions.

Dose.—Five to fifteen grains.

Preparation.—Barbadoes aloes, ℥ij.; hard soap, ℥j.; each in powder; add oil of caraway, fʒj.; confection of roses, ℥j.; and beat till thoroughly mixed.

PILULA ALOES SOCOTRINÆ.—Pill of Socotrine Aloes.—Employed in a similar manner to the last, and possessing the same properties.

Dose.—From five to fifteen grains.

Preparation.—Socotrine aloes, ℥ij.; hard soap, ℥j.; each in powder; add volatile oil of nutmeg, fʒj.; confection of roses, ℥j.; and beat together till thoroughly mixed.

PILULA ALOES ET MYRRHÆ.—Pill of Aloes and Myrrh.—This has been long employed, under the term of Rufus's Pill, for a warm purgative and emmenagogue in cases of suppression of the menses.

Dose.—From five to fifteeen grains, as a purgative; when given as an emmenagogue, three to four grains are directed, twice or thrice in the day, frequently combined with preparations of iron.

Preparation.—Socotrine aloes, ℥ij.; myrrh, ℥j.; saffron, dried, ℥ss.; triturate together and sift, then add confection of roses, ℥ijss., and beat together into a uniform mass.

VINUM ALOES.—Wine of Aloes.—A warm purgative, useful in chlorotic and dyspeptic affections, and for gouty attacks.

Dose.—f℥ss. to f℥j.

Preparation.—Socotrine aloes, ℥jss.; cardamoms, ground, gr. lxxx.; ginger, in coarse powder, gr. lxxx.; sherry, Oij. Digest for seven days, and strain through calico.

TINCTURA ALOES.—Tincture of Aloes.

Dose.—f℥ss. to f℥j.

Preparation.—Socotrine aloes, in coarse powder, ℥iss.; extract of liquorice, ℥iss.; proof spirit, Oj. Macerate for seven days; filter, and add proof spirit, to make Oj.

DECOCTUM ALOES COMPOSITUM.—Compound Decoction of Aloes.—This decoction is liable to vary in its taste and appearance; when freshly made, it is often turbid, and very bitter, becoming clearer and less unpleasant after being kept for some time; it is decomposed by acids and most metallic salts. It operates as a mild purgative, particularly useful in dyspeptic and gouty conditions of the system, and well suited for persons who suffer from hæmorrhoidal affections, as it is little liable to irritate the rectum.

Dose.—From f℥j. to f℥ij., or upwards.

Preparation.—Extract of Socotrine aloes, gr. xc.; myrrh, bruised, gr. lx.; triturate with carbonate of potash, gr. xl.; add saffron, chopped fine, gr. lx.; extract of liquorice, ℥ss.; and boil for ten minutes with distilled water, f℥xiv., in a covered vessel; cool, strain through flannel, and add compound tincture of cardamoms, f℥iv., with as much distilled water as may be necessary to make up the quantity to f℥xvj.

ENEMA ALOES.—Enema of Aloes.—Is used as a cathartic; in cases of amenorrhœa; and for expelling thread worms, the *Oxyurus vermicularis*, from the rectum. The dose employed is sufficient for an adult.

Preparation.—Aloes, gr. xl.; carbonate of potash, gr. xv.; mucilage of starch, f℥x. Mix, and rub together.

URGINEA SCILLA.—The Squill.—This plant is perennial, developing a large bulb; it grows on the sea coasts of the Mediterranean, in France, Spain, and Africa, &c., and throws up its flower stems about August. The bulb is the officinal portion; it is pear-shaped, varying in size from that of the closed hand to a child's head; consisting of closely imbricated scales, like an onion, the outer ones thin and dry, forming a membranous coating; two varieties are described, that differ in their colour, though apparently similar in medical properties: the white or Spanish squill, which is preferred in Europe, and the red or Italian one. The recent bulb abounds in acrid viscid juice, and will inflame the skin when handled; by drying its acridity is much diminished, and, according to Vogel, 100 parts of fresh squill are reduced to eighteen, losing about four-fifths of its weight. As imported, it always consists of yellowish, somewhat translucent pieces, which when dry are brittle, but readily attract moisture, becoming flexible; its odour is slight, and its taste bitter, acrid, and nauseous; under the microscope numerous bundles of acicular crystals are observed in the cells of the plant, constituting, as described by Mr. Queckett, about ten per cent. of its weight; the composition of these raphides is still undetermined. Squill consists, according to the observations of M. Marais, of mucilage, sugar, tannin, and some fatty matter, ten per cent. of a red acid colouring substance, two of a yellow acid odorous principle, and one per cent. of scillitin; this body forms pale yellow spangles, intensely bitter, which attract moisture; it is very soluble in alcohol and ether, but insoluble in water; it contains nitrogen, and is poisonous, acting as a narcotic, and paralyzing the heart even in small quantities. Squill requires to be kept in a dry place, as it soon softens and becomes mouldy, absorbing water from the atmosphere.

BOTANY.—Bulb large, perennial, half above ground; leaves broad, lanceolate, appearing after the flowers; scape one to three feet high, ending in a long spike of whitish flowers; bracts large; anthers yellow; capsule rounded, three-celled; seeds numerous, in two rows.

EFFECTS.—In large doses squill causes nausea, vomiting, and purging; and, according to Vogel, twenty-four grains have destroyed life, acting as a narcotico-acrid poison. It is employed as a diuretic, expectorant, and emetic. When given to induce diuresis, it is frequently combined with digitalis and calomel, or blue pill, particularly for the anasarca depending on valvular disease of the heart, and is unsuited for those cases where there are any inflammatory symptoms present, or granular degeneration of the kidneys. As an expectorant, it is used in repeated small doses to promote the secretion and discharge of mucus in chronic catarrhal and asthmatic attacks, and other cases for which polygala is prescribed; it is often given to young children, to nauseate, and assist free expectoration in recent catarrhs, but is unfit for delicate subjects with irritable stomachs, and is also liable to derange the bowels and cause purging. It is better fitted for the latter stages of hooping cough and subacute bronchitis, in which syrup of squill is a useful addition to other stimulating expectorants. The uncertainty of its operation, and the violence with which it sometimes acts when given in full doses, form important objections against the use of this drug.

DOSE.—Powdered squill will operate as an emetic in about ten-grain doses; when given as an expectorant or diuretic, the average dose is one grain, gradually increased until nausea is induced.

PILULA SCILLÆ COMPOSITA.—COMPOUND SQUILL PILL.—Is chiefly given in chronic bronchitic and asthmatic affections, and sometimes as a diuretic; it is liable to spoil by being long kept.

DOSE.—Five to ten grains, three or four times in the day.

PREPARATION.—Hard soap, ℥j.; reduce to powder, and mix with squill, in fine powder, an ounce and a quarter; ginger, in fine powder, ℥j.; ammoniac, in powder, ℥j.; add treacle, by weight, ℥ij., or a sufficiency, and beat into a uniform mass.

TINCTURA SCILLÆ.—TINCTURE OF SQUILL.—Used as an addition to diuretic or expectorant mixtures, and liable to nauseate if given in large doses.

DOSE.—From ten to thirty drops, taken three or four times in the day.

PREPARATION.—Squill, bruised, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, similar to tincture of aconite; to yield Oj.

SYRUPUS SCILLÆ.—SYRUP OF SQUILL.—Is occasionally given to children affected with catarrh or hooping cough, in repeated teaspoonful doses, every quarter of an hour, to cause vomiting; and added to stimulating expectorant mixtures, for the bronchitic attacks of advanced life, or for treating the latter stages of pneumonia. The acetic acid with which it is made renders it unsuited for combining with preparations containing ammonia.

DOSE.—From fʒj. to fʒij.

PREPARATION.—Digest squill, bruised, ℥ijss., in dilute acetic acid, Oj., for three days, with gentle heat; express; add proof spirit, f℥jss.; and filter. Dissolve in the fluid, refined sugar, lb. ij., with the aid of heat. The product should weigh lb. iij. ℥ij., and have sp. gr. 1·330. (It measures Oj.; f℥xvijss.)

MELANTHACEÆ.—Herbs, with fibrous or bulbous roots; leaves sheathing; perianth tubular, or in six pieces; stamens six; anthers opening outwards; ovary three-celled, many-seeded; styles three; capsule dividing into three portions superiorly; albumen dense.

COLCHICUM AUTUMNALE.—MEADOW SAFFRON.—The colchicum plant inhabits moist meadows and pastures over the greater part of Europe, but is rare in northern districts; it is very abundant in some localities in England and Ireland, though scarce in others, and is a doubtful inhabitant of Scotland. For officinal use it is largely grown in the medicinal gardens of the south of England. The fresh corm is directed to be employed, collected about the end of

June; it is usually considered most active nearly a month later, as the young corm has then become fully developed, and has not thrown out its flower shoot; it is about the size of a chestnut, flattened on one side, where the undeveloped bud is lodged, covered with a thin brown membranous coat; inside this it is pale yellow, solid and fleshy; the colour of the transverse section is pure white, and it yields an acrid milky juice, of an unpleasant bitter taste. The corms are also directed to be dried in transverse slices about a line thick, at a temperature not exceeding 150°; they are oval, notched at one part of the surface, but should not appear "fiddle-shaped." It is difficult to destroy the vitality of the young shoot, and when carelessly gathered or dried, the activity of the plant is impaired; the bitterness of their taste is a good practical test of their efficacy. One part of dried colchicum is obtained from about three of the recent corms.

SEMEN COLCHICI.—Colchicum seeds should be gathered when fully ripe, during the summer of the following year after the flowers; they are hard, reddish-brown, and nearly as large as white mustard seed; their chief advantage is, that they are less liable to become injured than the corm when long kept.

The analysis of colchicum is still imperfect. Geiger and Hesse obtained a crystalline substance, termed colchicia, which closely resembled veratria in properties, but was distinguished by its solubility in water, by not causing sneezing, having no acridity, and also being crystallizable. Dr. J. M. Maclagan failed to verify these observations, and invariably found the bitter substance he got was deposited as a brown resinous mass. Water, vinegar, and proof spirit are perfect solvents of the active principles of the corm or seeds.

BOTANY.—During flowering there are no leaves; the perianth is long and tubular, rising from a spathe, purple above, resembling a crocus; stamens six; ovary underground, with three long thread-like styles; capsule three-valved, with many seeds, appearing in spring, when the leaves are fully developed; they are broadly lanceolate, eight to ten inches long, and one and a half wide; corm ovate, solid, in shape like a tulip.

EFFECTS.—An over-dose of colchicum will produce dangerous, or even fatal results; excessive nausea and vomiting, violent purging, thirst, sinking, and failure of the circulation, with great tenderness of the abdomen, are the ordinary symptoms; it occasionally causes vertigo and stupor, but cerebral disturbance is unusual. In full medical doses it is liable to induce nausea, or severe diarrhœa, reducing the frequency of the pulse, and attended with much debility; and it would appear that some persons are unusually susceptible of its action; for death has ensued from f℥ijss. of the tincture taken at one time, and from f℥iijss. of the wine given in divided quantities. In medicine the preparations of colchicum are chiefly employed for relieving gouty attacks; some regard it as a specific, and it certainly does at times afford relief without any very obvious effects following its use; others consider it simply a sedative and eliminating agent, and point to its lowering the pulse, and to an augmented discharge of uric acid by the kidneys, as proofs of its action, and also to the frequency with which it causes free bilious evacuations; but none of these are so invariably observed that they can explain its mode of cure. Again, there are many good practitioners who accuse it of rendering the attacks more frequent, and of confirming the gouty predisposition. The rapidity with which a fit of gout will yield to its administration, and the increased liability there is to a patient indulging in excesses during the period of comparative health which follows, may have more to do with the speedy return of the disease than the colchicum; besides, it would seem as if the gouty paroxysm is necessary to expel from the system the special morbid elements that have accumulated there, and colchicum appears merely to cut the paroxysm short, without securing a perfect elimination of the disease, and it is also admittedly liable to induce atonic or irregular gout.

In acute febrile rheumatism, colchicum cannot be relied on; in some of the chronic forms which approach to gout it is of occasional benefit, and is sometimes given towards the termination of the attack with advantage, when it was unsuccessful at an earlier period. Sir B. Brodie considered it best suited for those cases where several joints were affected, and where the synovial sheaths of the tendons and bursæ mucosæ became engaged; it is useless in the pericardial and endocardial intercurrent inflammations of rheumatic fever. There appears to be a connexion between that state of system which attends gout and the squamous eruptions; the same individual may suffer from both, or they occasionally alternate—the eruption appearing in the intervals of gouty attacks; and Dr. Burgess finds that some severe cases of psoriasis will yield to colchicum given with alkalies. Dr. Maclagan also has treated obstinate urticaria in a similar manner, being induced to do so by observing a notable deficiency in the quantity of urea and uric acid excreted by the patients who suffered from it. Colchicum has also been employed as an antiphlogistic for inflammatory and febrile diseases, and in dropsies as a cathartic and diuretic, and has been found of service in chronic bronchitis and humoral asthma, but these are exceptional uses of this drug.

ANTIDOTES.—In cases of poisoning with colchicum, stimulating emetics should be given, followed by diluents, and if necessary opiates, to check the purging; brandy, coffee, and other stimulants are usually required, from the failure of the circulation. Vegetable astringents are recommended, as tannin forms an insoluble precipitate with colchicia.

DOSE.—Colchicum may be administered in small quantities, gradually increased; or in larger doses at greater intervals, so as to produce decided evacuations, and purge; it is seldom given in the form of powder; the average dose is two to eight grains; some prefer employing the powder of the seeds, which is considered to have the advantage of being more uniform in strength; and is about one-half more powerful.

VINUM COLCHICI.—Wine of Colchicum.—This preparation is frequently prescribed in combination with magnesia; it is liable to disagree when given in over-doses, and purge severely. It has sometimes been applied externally with alkalies, as potash or soda, for lotions over gouty and rheumatic swellings, but appears to possess little medical properties when thus used.

Dose.—From ten drops to fʒj., three or four times in the day.

Preparation.—Colchicum corms, dried and sliced, ʒiv.; sherry, Oj.; macerate for seven days; press and strain through calico; pour on the marc sufficient sherry to make up Oj.; and, having pressed and strained as before, mix the fluids.

TINCTURA COLCHICI SEMINIS.—Tincture of Colchicum Seed.—Is employed in the same manner as wine of colchicum, and, allowing for the greater activity of the seeds, is probably of about equal medical strength.

Dose.—Ten drops to fʒj., three or four times in the day.

Preparation.—Colchicum seeds, bruised, ℥ijss.; proof spirit, Oj., prepared by maceration and percolation, similar to tincture of aconite; to yield Oj.

EXTRACTUM COLCHICI.—Extract of Colchicum.—This preparation is greatly increased in energy by the separation of its fecula, albumen, and starch; its medical uses are similar to the other compounds of colchicum.

Dose.—Half a grain to a grain and a half, taken three or four times daily.

Preparation.—Fresh colchicum corms, deprived of their coats, lb. vij.; crush them; press out the juice; allow the feculence to subside, and heat the clear liquor to 212°; then strain through flannel, and evaporate by a water bath, at a temperature not exceeding 160°, to a proper consistence.

EXTRACTUM COLCHICI ACETICUM.—Acetic Extract of Colchicum.—The use of the acetic acid is to extract the alkaline principle more perfectly; it is often combined with purgative pill masses or mercurials, when an active aperient is required, or with the intention of increasing the secretion of bile.

Dose.—From half a grain to two grains, repeated, if necessary, three or four times in the day. The extraction of the starch and albumen materially increases its activity.

PREPARATION.—Fresh colchicum corms, deprived of their coats, lb. vij.; crush them, and add acetic acid, f℥vj.; press out the juice; allow the feculence to subside, and heat the clear liquor to 212°; then strain through flannel, and evaporate by a water bath, at a temperature not exceeding 160°, to a proper consistence.

ASAGRÆA OFFICINALIS.—CEVADILLA.—Is employed for preparing veratria; it consists of the follicles, loose seeds, stalks, and abortive flowers of the Asagræa plant, and perhaps of *Veratrum sabadilla* also, imported from Vera Cruz and Mexico. Each fruit consists of three dry follicles, adhering at their base, about half an inch in length and a line and a half in diameter; ovate and acuminate, pale yellowish-brown, and empty, or containing one or two dark brown wrinkled and elongated seeds, with little odour, and an acrid bitter persistent taste; when powdered, they produce violent sneezing. Analyzed by Meissner, they afforded about one-half per cent. of veratria, with fatty matter, wax, resin, and other vegetable constituents; and Pelletier has described a peculiar volatile principle, termed cevadic acid.

BOTANY.—A bulbous herb, with grass-like leaves, roughish at the margin; spike dense, a foot and a half long, seated on a scape six feet high; flowers white, with a bract at the base; anthers yellow; follicles three, papery; seeds scimitar-shaped, corrugated and winged.

USES.—Besides being employed for making veratria, a strong tincture has been applied to the skin as a topical rubefacient in chronic rheumatism and neuralgic affections; and on the Continent the powdered seeds are administered to expel worms. It requires to be given with caution, commencing with small doses, and presents no advantages over other and better known anthelmintics.

DOSE.—From half a grain to five grains of the seeds, in powder, have been given with some purgative, as rhubarb; it requires to be repeated daily for three or four doses.

VERATRUM VIRIDE.—GREEN HELLEBORE.—The rhizome of this American plant, also termed swamp hellebore, from its growing in marshy districts, has been much used in the United States; it resembles closely the root of *Veratum album* in appearance and properties, consisting of a bulbous corm, with numerous pale yellow radicles, having an acrid taste, and causing a tingling sensation in the fauces. Though as yet but imperfectly examined, it appears to contain veratria; special qualities have been claimed for it, particularly that when given in large quantities it does not cause purging; and at the same time it exerts such a powerful influence over the circulation, and over inflammatory diseases, that it forms an effectual remedy in several morbid states.

PREPARATION.—The TINCTURE of the United States' Pharmacopœia is made by percolating sixteen troy ounces of the root, in powder, with rectified spirit, to obtain Oij. The FLUID EXTRACT is procured by moistening sixteen troy ounces of root with rectified spirit, f℥vj.; percolating to obtain Oss. of tincture, and then continuing the process until Oijss. more are procured; evaporating this to Oss., and adding the former reserved tincture, and filtering; to yield altogether Oj.

EFFECTS.—In large or frequent doses it causes a sense of vertigo or faintness, with nausea, vomiting, and general prostration; the vomiting is usually slowly induced, and the prostration may become alarming, but is easily relieved by giving opiates and stimulants; ordinary medical doses reduce the frequency of the pulse, sometimes so low as thirty-five or forty beats in the minute, rendering it small and feeble, and at the same time increasing the secretions. It has been confidently advised for pneumonia and other acute inflammatory attacks, in puerperal fevers, rheumatism, and gout, and has proved of service in cases of spasmodic asthma; it requires to be given with caution. Dr. Wood, of America, considers six to eight drops of the tincture, repeated every third hour, and increased if necessary, to be a safe dose; half this quantity will suffice of the fluid extract.

VERATRIA ($C_{64}H_{52}N_2O_{16}$).—This is described as an alkaloid, obtained from Cevadilla, not quite pure; it is an uncrystallizable pale grey powder, sometimes nearly white, without smell, tasting strongly bitter and acrid, and causing a sensation of numbness and tingling in the tongue; the smallest quantity will excite violent and continued sneezing; it is insoluble in water, and dissolves sparingly in spirit or ether, but readily melts in dilute acids, with the exception of slight traces of an insoluble brown resinoid matter; its sulphate and hydrochlorate can be got crystallized. According to Pereira, when pure it has no perceptible bitterness, though very acrid; it fuses at 240°, melts into a yellow liquid, and when burned should leave no residue. It is stated that lb. j. of cevadilla will yield about sixty grains of veratria.

PREPARATION.—Macerate cevadilla, lb. ij., with half its weight of boiling distilled water in a covered vessel for twenty-four hours; remove, squeeze, and dry it thoroughly with a gentle heat; beat it now in a mortar, and separate the seeds from the capsules by brisk agitation in a deep narrow vessel, or by winnowing it gently on a table with a sheet of paper. Grind the seeds in a coffee mill, and form them into a thick paste with rectified spirit; pack this firmly in a percolator, and pass rectified spirit through it till the spirit ceases to be coloured; concentrate the spirituous solution by distillation so long as no deposit forms, and pour the residue, while hot, into twelve times its volume of cold distilled water. Filter through calico, and wash the residue on the filter with distilled water till the fluid ceases to precipitate with ammonia; to the united filtered liquids add solution of ammonia in slight excess; let the precipitate completely subside; pour off the supernatant fluid; collect the precipitate on a filter, and wash it with distilled water till the fluid passes colourless. Diffuse the moist precipitate through distilled water, f℥xij., and add gradually, with diligent stirring, sufficient hydrochloric acid to make the fluid feebly but persistently acid; then add purified animal charcoal, gr. lx.; digest at a gentle heat for twenty minutes; filter, and allow the liquid to cool; add ammonia in slight excess, and, when the precipitate has completely subsided, pour off the supernatant liquid. Collect the precipitate on a filter, and wash it with cold distilled water till the washings cease to be affected with nitrate of silver acidulated with nitric acid; lastly, dry the precipitate, first by imbibition with filtering paper, and then on the steam bath.

The maceration with water facilitates the separation of the seeds, and prepares them for being exhausted with rectified spirit. The tincture thus obtained contains veratria united with a vegetable acid, probably gallic acid, and resinous, oily, and colouring matters, much of which are got rid of when the evaporated tincture is added to water. The filtered liquid, decomposed by excess of ammonia, throws down impure veratria, which is still further purified by washing. It is subsequently converted into a hydrochlorate, decolorized with animal charcoal, and finally precipitated by ammonia, and then washed and dried for use.

PURITY.—Veratria is liable to be contaminated with variable quantities of resinous matters, and to be intentionally adulterated with other white powders; it is difficult to determine its purity; it should dissolve in ether, and if burned leave no fixed residue; with fuming sulphuric acid it becomes blood-red, and afterwards violet-coloured.

EFFECTS.—Veratria has been administered internally for neuralgic affections, gout, rheumatism, and various obscure nervous attacks; its properties would seem to be similar to those of colchicum, over which it has little or no advantage; and its dangerous poisonous effects in large doses, and the uncertainty of its composition and purity, are sufficient objections to its administration. In France it has been recommended for the treatment of acute inflammatory diseases, particularly pneumonia and articular rheumatism.

Applied externally in ointment or embrocation, it causes a sensation of warmth in the part, and peculiar tingling, with sometimes evanescent erythema; it is employed for scrofulous affections of the joints, chronic neuralgic pains, and the stiffness resulting from old sprains and injuries; rubbed over the orbit, it is one of the counter-irritating applications that have been supposed to assist in dispersing incipient cataract. If used to the denuded cutis, it is powerfully irritating; and, as already mentioned, snuffed into the nares it excites violent sneezing, and a copious flow of mucus. The powder of VERATRUM ALBUM, which also contains veratria, was formerly employed as an errhine for this purpose, but all this class of remedies have now become obsolete.

ANTIDOTES.—Accidents from veratria will require similar treatment to that directed for colchicum.

DOSE.—If ever used internally, the dose at first should not exceed one-twelfth to one-sixth of a grain, gradually increased when necessary; from its unpleasant acridity, it is best given made into pills. A liniment for external application is made by dissolving ten to twenty grains of veratria in rectified spirit, f℥j.

UNGUENTUM VERATRIÆ.—**Veratria Ointment.**—Is sometimes employed in the treatment of scabies, for chronic neuralgic pains, and over scrofulous affections of the joints; about the size of a small nut should be rubbed in night and morning, and the frictions continued until considerable heat and tingling are produced. It is far inferior to aconitia for relieving neuralgia.

Preparation.—Veratria, gr. viij.; olive oil, fʒss. Rub together, and mix thoroughly with prepared lard, ℥j.

Tincture of Veratria.—A formula is given by Magendie, consisting of veratria, gr. iv., dissolved in rectified spirit, f℥j., designed for internal use. It is employed in doses of gtt. x. to gtt. xx., as a substitute for tincture of colchicum in the treatment of gout.

ENDOGENS (SUBCLASS GLUMALES).

Gramineæ.—Herbs, with hollow stems and nodes; leaves alternate, narrow, sheathing, and ligulate; flowers in spikelets, arranged in terminal spikes, racemes, or panicles; inflorescence consisting of alternately disposed bracts or glumes, the two lower usually empty, the upper one enclosing a smaller *palea*, within which is the minute flower, composed of two very minute scales; from one to three stamens, with versatile anthers; and a one-celled, one-seeded ovary, having two feathery styles; fruit a caryopsis; embryo small, at the base of mealy albumen.

ERGOTA.—**Ergot.** (The grain of common rye diseased by the presence of an imperfect fungus.)—This morbid alteration of the growing grain of rye is most common in low damp fields, during warm summers; and several other grasses and sedges are liable to become attacked by a similar affection. Various opinions have been entertained as to its nature: some have considered it a morbid growth, caused by moisture or insects; others, that it is a perfect fungus; but it evidently consists of the altered grain, and Mr. Queckett traced the stages of its development under the microscope with much accuracy. At first the young grain of rye and its appendages are seen covered with minute sporidia and filaments that resemble mildew, cementing the anthers and stigmas together, and at this time the flower abounds in a sweet juice; when the ergot is half grown, the grain becomes dark purplish-coloured, the upper part is roughly tuberculated, and has a vermiform appearance, and the formation of fresh sporidia has nearly ceased; the ergot now rapidly elongates, and may become four or five times the length of a healthy grain, from which circumstance it is popularly termed "spurred rye." The vegetative growth in this stage was some years since named *Oïdium abortifaciens*, and supposed to be a definite vegetation; it is now recognised to be an imperfect state of development of one or perhaps more closely allied fungi, the principal species being *Cordyceps purpurea*. To obtain this interesting plant in its perfect condition, it is merely requisite to place ergot in soil kept moderately damp, but without encouraging the growth of mould, and after a few months we have a tolerable certainty of observing its formation.

Mature ergot consists of solid grains, when fresh somewhat flexible, varying from the third of an inch to an inch and a half long, tapering at the ends, and slightly curved like the spur of a cock, of imperfect triangular shape, and often irregularly cracked or fissured; the inside of the grain is purplish or yellowish-white; when in quantity it has an unpleasant and peculiar smell, resembling stale fish; and the taste, though not marked, is disagreeable and rather acrid. It seldom happens that more than a few grains of rye in each head become ergotized. When kept, it speedily deteriorates by exposure to air and moisture, but can be preserved for a considerable time in bottles when well dried, with a small portion of camphor, or in powder, if mixed with two parts of loaf sugar; it is also subject to be destroyed by a minute acarus, which eats away the interior of the grain, and forms a large quantity of powdery excrementitious substance, that is worthless for medical purposes.

According to M. Bonjean the fluid, pale yellow, fixed oil obtained from ergot, in the proportion of about one-third its weight, is poisonous, and acts directly on the nervous centres; whilst the watery extract, or ERGOTIN, alone possesses antihæmorrhagic properties. Dr. Wright supposed the medical action to depend altogether on this oil; but it appears probable that it should be ascribed to some other principle, accidentally present in it. When distilled with hydrate of potash, ergot yields trimethylia, $3\,C_2H_3, N$, which is also contained in considerable quantity in the roe of herrings; this is a volatile alkaloid, boiling about 41°, and emitting an inflammable vapour, having a powerful and disgusting fish-like odour.

ADULTERATIONS.—To avoid the substitution of old ergot—or the admixture of inert powders with it, the best plan is to purchase the substance entire, if possible from a fresh stock, early in autumn; it should be hard, free from dust and powder, and having a strong odour, but perfectly free from ammoniacal smell.

EFFECTS.—The protracted use of ergotized grain has caused wide-spread epidemic disease, of which two types are recognised—one convulsive, when giddiness, stupor, delirium, and convulsions are the leading symptoms; the other gangrenous, attended with low fever, formication of the skin, coldness or insensibility of the limbs, and dry gangrene: these are of extremely rare occurrence in our lands; but I have seen the edges of the ears slowly mortify in one case during the late famine years from using diseased rye for food. When given in a single large dose, it is liable to cause nausea, vertigo, and pain in the head, and sometimes stupor with dilated pupils, though such results are admittedly uncertain. The principal use of ergot in medicine is to excite muscular contraction in the fibres of the uterus; previous to the commencement of labour, it cannot always be relied on; and it is best suited for those cases where the os uteri is perfectly dilated, and no mechanical obstacle exists to the delivery of the child, the delay occurring solely from deficient pains. Dr. Hardy has shown that its administration endangers the life of the fœtus when labour is protracted for any length of time, by exercising a poisonous influence on the action of the hearts of both mother and child; so that it is necessary, after giving a dose of ergot, to watch with the stethoscope; and if the number of pulsations of the child's heart fall below 110 beats in the minute, *with intermissions*, instrumental delivery is imperative to save its life. After delivery it is of greater service to promote firm contraction of the uterus in cases of inertia; it is always better to secure the expulsion of the placenta previously, as ergot adds to the difficulty of extraction when there is any morbid adhesion of the afterbirth to the uterine walls. Repeated doses of ergot are also most serviceable in arresting hæmorrhage from the womb unconnected with pregnancy, and for expelling coagula of blood or uterine hydatids; this hæmostatic property has led to its administration for internal hæmorrhages generally, and several cases have occurred in which it assisted to check bleeding from the lungs caused by tubercular disease. It is questionable what influence ergot has in promoting the discharge of the catamenia in cases of suppressed menstruation. Drs. Dewees and Locock have found it successful, and recommend its employment; whilst Dr. Churchill states that it has failed in his hands. There is a popular belief that it will induce abortion: where it is necessary, from malformation or any other cause, to bring on premature labour, operative proceedings are invariably adopted; and once the uterine pains have fairly commenced, ergot may be given to render them more effectual.

DOSE.—The powder is convenient for extemporaneous use; it is given boiled with water, or, in cases of emergency, simply mixed with water or wine; in labour the average dose is twenty or thirty grains, repeated at intervals of fifteen or twenty minutes for about three doses; when a rapid action is necessary to check severe floodings, sixty grains may be employed at once; for other hæmorrhages the average dose is gr. v. to gr. xv., every three or four hours.

INFUSUM ERGOTÆ.—INFUSION OF ERGOT.—This may be flavoured with wine or aromatics; each f℥j. contains gr. xj. of ergot.

DOSE.—f℥j. to f℥ij., every quarter of an hour, when required to promote labour pains; or fʒss. to fʒj., given three or four times in the day, for cases of amenorrhœa.

Preparation.—Ergot, in coarse powder, a quarter of an ounce; boiling distilled water, f℥x. Infuse in a covered vessel for half an hour, and strain.

TINCTURA ERGOTÆ.—Tincture of Ergot.—This preparation is used in the same cases as the infusion, or added to it if necessary.

Dose.—fʒss. to fʒij.

Preparation.—Ergot, bruised, ℥v.; proof spirit, Oj., prepared by macerating and percolation, similar to tincture of aconite; to yield Oj.

EXTRACTUM ERGOTÆ LIQUIDUM.—Liquid Extract of Ergot.—Each fʒj. of this extract is considered to represent about fifty-five grains of ergot, or nearly an equal quantity. In preparing it, the ether is washed to remove the small portion of rectified spirit that it contains; the washed ether is used to dissolve out all the fixed pale yellow oil from ergot, which Bonjean considers poisonous; after this, the principle termed by him ergotin is dissolved out in the water, mixed with a portion of vegetable albumen that would prevent the solution from keeping; on the addition of spirit, the albumen is coagulated, and removed by filtration; the spirit also materially assists to preserve the fluid extract.

Dose.—From fʒss. to fʒj., given during labour; for other purposes, from gtt. x. to gtt. xv., three or four times in the day.

Preparation.—Take ergot, in coarse powder, lb. j.; place it in a percolator, and free it from its oil by pouring ether, Oj., over it, having previously shaken the ether with distilled water, Oss., in a bottle, and, after separation, decanted it; remove the marc, and digest it in distilled water, Oiij., at 160°, for twelve hours; press out, strain, and evaporate the liquor to f℥ix., and when cold add rectified spirit, f℥viij.; allow it to stand for an hour to coagulate, then filter; the produce should measure f℥xvj.

TRITICUM.—Wheat.—The flour obtained from wheat is liable to vary considerably in its composition, according to the fineness of the grain used in its preparation; the external part, which is brownish-coloured, tough, and hard, is difficult to pulverize, and is separated as a coarse residue by sifting, constituting the bran, whilst the finer inner portions of the grain yield flour. In each 100 parts it consists of about sixty of pure starch, six to ten of gluten, a small quantity of sugar or dextrin, a little oily and saline matters, and some fibrous or ligneous tissue.

Wheat Starch ($C_{12}H_{10}O_{10}$).—Is procured by coarsely grinding the wheat, and wetting it with water; after three or four days fermentation will commence; it is then mixed with a large quantity of water, and placed in a vat, where it is allowed to remain in steep for three or four weeks. Much of the gluten is got rid of by putrefaction; a small portion of the starch, and any dextrin that is present, are changed by the fermentation into a little alcohol and carbonic acid that escape; the alcohol, by becoming oxidized, is converted into acetic acid, and assists to dissolve out the residue of the gluten are the sour water; the liquid acquires a putrefactive, unpleasant odour, and pure starch subsides to the bottom of the vessel; it is then repeatedly washed, drained, and dried in large blocks, which spontaneously shrink into columnar masses, such as are met in commerce.

Starch exists in the cells of the grain in numerous amyloid particles, which are mostly of globular form, marked by irregular concentric circles, and having at one point, where it was attached to the cell wall, a conspicuous mark termed the hilum. Opinions are much divided as to the intimate structure of the globules. Mr. Busk considers that the plaitings or striations are due to the peculiar involutions of the vesicular wall; and Prof. Allman supports the ordinary idea, that they depend on the deposition of numerous concentric lamellæ. The centre of the granule is often filled with starch in an unconsolidated form. The largest starch grains are known as Tous la mois, and are obtained from a species of Canna; potato starch is about as large as the smallest grains of this; the ordinary size of wheat starch and sago is still less, and the granules of rice starch are the most minute of all; these differences are easily recognised by employing a microscope with authentic specimens of each starch for comparison. Starch is rendered blue by weak solutions of iodine; if heated to 300°, it acquires a buff colour, and is converted into British gum, or dextrine, which is soluble in cold water.

Adulterations.—The microscope will detect different starches by their size and shape; the examination is aided by adding a few drops of solution of potash (composed of one part of liquor potassæ and three of water), which will not affect wheat starch, but the granules of potato starch instantly swell to three or four times their natural size; and if pea or bean meal is present, its grains dissolve, and the hexagonal tissue of the seed is rendered obvious. Wheat flour also with polarized light presents a conspicuous black cross proceeding from the hilum, and oat starch has no such appearance. Donny proposes to test the meal of vetches or beans in wheat by exposing the suspected flour successively to the vapour of nitric acid and of ammonia; this will render wheat meal yellow, but the other meals become red.

Bread.—Made with wheat flour is used in the formation of charcoal poultice, and still more frequently to make the domestic BREAD AND WATER POULTICE; this is prepared by steeping slices of bread, free from crust, in boiling water, after a few minutes pouring off the water, and spreading the bread in a thin layer upon soft linen; it is occasionally medicated by the addition of liquor plumbi, or tincture of arnica.

Botany.—Spike four-cornered, imbricated; spikelets usually four-flowered; glumes two, ventricose, equal; stamens three; grains loose, convex outside, deeply furrowed within.

T : **Æstivum** is an annual plant, with awned glumes.

T : **Hybernum** is biennial, the glumes almost awnless.

Uses.—Gluten is used as an antidote in poisoning with corrosive sublimate or sulphate of copper, when eggs cannot be obtained; and in the treatment of diabetes a preparation termed "gluten bread" is strongly recommended.

Starch is applied as a dusting powder to excoriations and superficial eruptions; it is particularly useful in eczematous rashes; and when a more energetic action is required, it can be medicated by the addition of about one-fourth part of oxide of zinc; it is the best antidote for poisoning with iodine or bromine, and is used to prepare the mucilage of starch, and as a constituent of compound tragacanth powder.

Flour is directed for making yeast poultice.

MUCILAGO AMYLI.—**Mucilage of Starch.**—This is employed as the base for making all the officinal enemas, except the tobacco enema. Its preparation depends on the perfect trituration of the starch with water before boiling them together.

Preparation.—Starch, 120 grains; triturate with distilled water, f℥x., gradually added; then boil for a few minutes, constantly stirring.

Gluten.—Is separated from flour by forming it into a paste, and washing out the starch with a current of water; it is a grey tenacious, tasteless substance, which rapidly putrefies if moist; it consists of several azotized principles, two at least of which are separated by the action of hot alcohol, in which one dissolves, and the other remains insoluble; its percentage composition is, carbon, 55; hydrogen, 7·4; nitrogen, 16; oxygen and sulphur, 21.

Gluten Bread, for diabetic patients, will require to contain a considerable proportion of starch to render it eatable. The following formula, recommended by Pereira for a substitute, termed "bran bread," gives a preferable food:—"Wash coarse bran thoroughly with water on a sieve so long as the water is coloured, then dry it and grind in a mill to fine powder; mix sufficient of this into a paste with seven eggs, a pint of milk, half a pound of butter, and some caraways; divide into seven parts, and bake on saucers for about twenty minutes in an oven."

HORDEUM DISTICHON.—**Pearl Barley.**—Is procured by rounding the grains of barley in a mill after the husks are removed.

It consists of small oval grains, which are white and inodorous, and have a bland mucilaginous taste, retaining the traces of the longitudinal furrow of the seed. According to the analysis of Einhoff, barley meal contains 67 per cent. of starch, which resembles that got from wheat; gum, 4·6; sugar, 5; gluten, 3·5; albumen, 1·0, with salts, lignin, and water. Mr. Johnston states that it affords starch, 68; gluten, albumen, &c., 14; fatty matter, 2; fixed ash, 2; and water, 14, in every 100 parts.

BOTANY.—Spikelets three together, the lateral ones usually withered; glumes two, with awns; the central floret perfect, distichous, awned, the lateral ones male, awnless; stamens three; ovary hairy at the apex; grain oblong, furrowed longitudinally, adherent to the paleæ.

USES.—Powdered barley is much employed as a healthy and digestible food for young children; and is also an excellent addition to vegetable broths in the treatment of typhoid fever, in which, unless a liberal supply of farinaceous materials is added to the diet, there is much danger of our increasing the diarrhœa. It is used for making the decoction.

DECOCTUM HORDEI.—DECOCTION OF BARLEY.—Barley water is used as a demulcent drink in inflammatory and febrile diseases, and is improved by being flavoured with sugar, and a little lemon juice; it is sometimes employed for preparing gargles and enemas. An excellent decoction can be made more rapidly by using powdered barley.

DOSE.—*Ad libitum.*

PREPARATION.—Pearl barley, ℥ij.; wash it with cold water, and reject the washings. Boil with distilled water, Ojss., for twenty minutes in a covered vessel, and strain.

SACCHARUM OFFICINARUM. — THE SUGAR CANE. — The interesting group of substances which are classified by chemists as saccharine all present a common point of similarity in their ultimate composition, consisting of carbon united with oxygen and hydrogen, in the same proportions in which they form water; and many of them, therefore, admit of being easily transformed into other substances of this class by the addition or removal of the element of water. Several of them, also, can be subjected to fermentation, and, when oxidized by the agency of nitric acid, they afford oxalic acid.

The four principal varieties of sugar are:—CANE SUGAR, or Sucrose ($C_{12}H_{11}O_{11}$), chiefly got from the sugar cane, but also obtained from beet root, the sugar maple, and several tropical palms; it is two and a half times sweeter than glucose; sp. gr. 1·6; soluble in about one-third its weight of cold water, and sparingly dissolved by warm alcohol, crystallizing in four-sided rhomboidal prisms, with dihedral summits, colourless when pure; it melts at about 356°, and at a higher temperature decomposes, becoming brown-coloured and bitter from the formation of CARAMEL, and giving off a peculiar odour; it readily ferments, and is distinguished from other varieties of sugar by not becoming brown when boiled with solution of potash, or readily reducing the hydrated oxide of copper in the manner effected by glucose. A solution of cane sugar also rotates a ray of polarized light 100° to the right; it has the property of dissolving many metallic oxides; and the compound which it forms in this manner with lime, $CaO, C_{12}H_{11}O_{11}$, is used in pharmacy; this has a bitterish taste, and is very soluble in water.

FRUIT SUGAR.—Or Fructose ($C_{12}H_{12}O_{12}$), exists in most ripe fruits, and in recently gathered honey; it can also be obtained by boiling starch, gum, or woody fibre with dilute sulphuric acid, when they readily combine with an additional quantity of water; it is not crystalline, turns the plane of polarized light 35° to the left, and by keeping easily passes into the next variety, assimilating two additional equivalents of water.

GRAPE SUGAR.—Or Glucose ($C_{12}H_{12}O_{12} + 2\,HO$), forms the hard sweet masses got in several dried fruits. It is found in honey, when long kept, and in the urine of diabetic patients, and can be procured by combining fruit sugar with the elements of water. It is much less soluble in water than cane sugar, though more readily dissolving in spirit, from which it is deposited in anhydrous prisms by using boiling alcohol containing five per cent. HO; it tastes far less sweet than cane sugar, and its solution rotates polarized light to the right through only 73°. When boiled with liquor potassæ, it produces a brown coloration, forming melassic acid,—a reaction used in testing diabetic urine; but the most distinctive test is its property of reducing the oxide of copper to a red suboxide, which will determine the amount of grape sugar present in a mixture;[*] by fermentation, also, each grain of grape sugar affords a cubic inch of carbonic acid, that can be collected and measured to ascertain the quantity of sugar in any solution.

SUGAR OF MILK ($C_{24}H_{24}O_{24}$).—Will require to be considered separately, as it is now officinal; when pure, it is incapable of being fermented.

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[*] To estimate the amount of glucose, the plan of M. Barreswil is usually followed. Each equivalent of grape sugar reduces ten equivalents of oxide of copper to red suboxide; by preparing, therefore, a standard copper solution, its quantity can be ascertained. For this purpose, crystallized sulphate of copper, ℥j.; cream of tartar, ℥iij.; pure carbonate of potash, ℥jss.; solution of caustic soda, sp. gr. 1·12, f℥xiv. to f℥xvi., are added to water, until the solution measures 15,160 water grains. 200 measured grains of this solution contain sufficient copper to become reduced by one grain of grape sugar; on gently heating, a yellow hydrated suboxide falls, and on boiling is altered to anhydrous red suboxide. (Avoirdupois weights are used.)

Botany.—Stem solid, jointed, hard externally, six to twelve feet high, abounding in saccharine juice; leaves long, in two rows, and sheathing; flowers in long terminal panicles, silvery-grey coloured, from soft hairs around each flower; spikelets fertile, in pairs, one sessile and one stalked; two-flowered, the upper floret perfect; stamens three. (Several varieties of SUGAR CANE are distinguished in cultivation.)

Cane Sugar is procured by cutting the canes when ripe close to the ground, and strongly expressing the sap with rollers; the juice affords from eighteen to twenty per cent. of saccharine matter—a portion of which is not crystallizable. Some milk of lime is added as soon as possible, to unite with a peculiar azotized principle, allied to albumen, that readily putrefies, and destroys the crystalline sugar; it is then clarified with heat, and the clear fluid drawn off and evaporated until it commences to assume a granular consistence; this constitutes raw sugar; the uncrystallized portion which drains away is termed molasses. Raw sugar is refined in England by dissolving it in a small quantity of water; it is heated with bullock's blood to separate impurities, and filtered through recently burned and purified animal charcoal, which removes its colouring; the syrup is then boiled down *in vacuo* and poured into moulds, where it solidifies, forming REFINED SUGAR; the viscid dark brown syrup which drains off from the moulds is TREACLE; it differs from molasses in being much thicker, and also in its flavour; it contains nearly seventy-five per cent. of solid matter; sp. gr. about 1·40.

Adulterations.—Refined sugar is directed to be employed for medical purposes; it is never subject to adulteration at present, but of course is liable to vary considerably in its quality and commercial value.

Uses.—Refined sugar is used in preparing syrups, confections, and lozenges; for preserving protosalts of iron from oxidation when exposed to the air; to dissolve lime in the saccharated solution of lime, and generally as a flavouring substance to render medicines more palatable. Treacle is employed in forming pill masses, as it contains uncrystallizable sugar, and preserves them in a soft condition for a considerable time.

SYRUPUS.—**Syrup.**—Is used for adding to mixtures for flavouring; if made too weak, it is liable to ferment rapidly in warm weather; and if over-concentrated, part of the sugar will deposit in crystals, until its strength becomes considerably reduced. It is injured by protracted boiling.

Dose.—It is generally considered that f℥j. to f℥ij. of any syrup is sufficient for flavouring an ordinary draught. In mixtures it is used in the proportion of f℥ss., or upwards, to f℥viij.

Preparation.—Refined sugar, lb. v., distilled water, Oij. Dissolve with the aid of heat, and, after cooling, add as much distilled water as may be necessary to make the weight of the product lb. vijss.; the sp. gr. should be 1·330; (it will measure Oivss.)

ACROGENS (FILICES).

Filices.—Leafy plants, with rhizomes, the fronds coiled up before expanding in a circinate form, having a forked venation; fructification consisting of capsules or sporangia, usually arranged in clusters or sori, and covered with a thin membrane when young, termed the indusium; each containing numerous minute spores. In germinating the spores produce a green leafy prothallus, upon which special antheridia and pistillidia are developed, and from them arises the future plant.

ASPIDIUM FILIX MAS.—The Male Fern.—The rhizome of this indigenous fern is directed to be gathered in summer; it grows in woods and shady situations, and when old is often of considerable size. The dark unsound parts, scales, and much of the footstalks with which it is closely imbricated, should be removed; whilst fresh the rhizome is of light yellowish-green colour, it has a strong unpleasant odour, and tastes nauseous and bitter, with some astringence; and requires to be carefully preserved in stoppered bottles to prevent it from becoming deteriorated, after being well and quickly dried. Besides tannin, sugar, starch, pectin, and other ordinary vegetable constituents, it affords in every 1000 parts 0·4 of a dark-coloured volatile oil, and sixty of greenish fixed oil, on both of which its anthelmintic properties appear to depend.

Botany.—Rhizome short, thick, and horizontal; fronds large, in a circular tuft, two or three feet high, stiff, broadly lanceolate, bipinnate, the pinnæ obtusely serrated; sori rather large, in two rows, near the central vein, with a conspicuous reniform indusium.

Effects.—When fresh and recently gathered, male fern is an invaluable anthelmintic for expelling the tape worm; it is seldom used in substance, the ethereal extract being preferred for internal exhibition. In all cases where we desire to remove this worm, a brisk purgative should be first given, and the patient, for at least twenty-four hours, ought to employ soft articles of food, to leave the parasite exposed to the action of the remedy. The anthelmintic is best administered the following morning fasting, and if necessary, followed by another purgative within three or four hours afterwards; by this means the medicine has the best chance of acting perfectly upon the animal.

Dose.—A quarter of an ounce or upwards may be given of the fresh powder; its bulky form and unpleasant taste render the extract much preferable.

EXTRACTUM FILICIS LIQUIDUM.—Liquid Extract of Fern Root.—This should consist of the dark brown oil and the lighter-coloured green fixed oil, both extracted by the ether, with some resinous matter, colouring and other principles; it has a thick syrupy consistence, and a strong odour of the recent plant.

Preparation.—Fern root, in coarse power, lb. ij.; mix with ether, Oij.; pack in a percolator, and add Oij. more of ether at intervals until it passes through colourless. Let the ether evaporate on a water bath, or recover it by distillation, and preserve the oily extract.

According to Peschier, the rhizome is worthless after being kept for two years. Soubeiran obtained from a pound of rhizome f℥jss. of extract.

Effects.—This preparation, when well made, is generally preferred for internal use. The average dose is f℥ss. to f℥j.; and Christison recommends it to be made into emulsion with yolk of egg, syrup of orange and water being gradually added.

THALLOGENS (LICHENS).

Lichenales.—Aërial mycetals, chiefly nourished by the surrounding medium, and producing in the thallus green bodies resembling chlorophylle, termed gonidia, arranged singly, in bundles, or moniliform rows; fruit of sporidia contained in asci, or with secondary fructification, seated on sporophores.

CETRARIA ISLANDICA.—Iceland Moss.—The entire lichen is collected for medical use, chiefly on the mountains of Northern Europe. Though abundant on several of our own mountains, it is never gathered here for sale. It is brownish-white, foliaceous, and cartilaginous, sometimes marked with red spots above, and paler on the under surface, almost odourless, and having a bitter mucilaginous taste; the fructification is rather rarely observed. The frond contains a considerable quantity of amylaceous matter diffused through its mass, not aggregated as in the higher plants into starch particles; its bitterness is due to about three per cent. of cetraric acid, $C_{34}H_{16}O_{15}$, which is intensely bitter, not volatile, and readily dissolved by alkaline solutions; it is also soluble in boiling rectified spirit, from which it deposits again on cooling, and can be thus prepared: under the term "CETRARIN," it has been administered on the Continent for the cure of intermittent fever, given in doses of gr. ij. to gr. v., three or four times in the day.

Botany.—Thallus erect, foliaceous, deeply laciniated and lobed; apothecia naked, brown, and flat, with an elevated border situated near the edge of the thallus on broad laciniæ. It belongs to the subdivision of gymnocarpous lichens.

Effects.—Iceland moss swells up in cold water, and by protracted boiling forms a thick mucilaginous solution, that gelatinizes when cool; its medical action is that of a mild tonic, useful as an addition to bitter and expectorant mixtures. It has been principally recommended for chronic catarrhal affections, phthisis, and diseases of debility; but its value as a remedial agent is trifling. It is sometimes employed as an article of diet; for this purpose, the bitter principle is extracted by digestion, in a weak alkaline solution of carbonate of soda or potash, and afterwards washing with cold water, or by macerating with water, at 180°, for three or four times, before boiling the lichen into jelly; it may be flavoured with wine, sugar, or aromatics, and forms an easily digested food.

DECOCTUM CETRARIÆ.—Decoction of Iceland Moss.—Is a useful addition to cough mixtures for patients in phthisis, who find sweet preparations objectionable; and also to decoction or infusion of cinchona, when a mild bitter is indicated. It is too dilute to gelatinize on cooling.

Dose.—f℥ss. to f℥j., given occasionally.

Preparation.—Iceland moss, ℥j.; wash it with cold water to remove impurities; then boil with distilled water, Ojss., for ten minutes in a covered vessel, and strain; the product should measure about Oj.

LITMUS.—Is imported from Holland in small rectangular friable cakes, of blue colour, made up with chalk, or plaster of Paris, and having a peculiar violet odour. It is obtained chiefly from *Roccella tinctoria*, and allied species, gathered on maritime rocks exposed to the Atlantic. These lichens are macerated for several weeks in a mixture of lime, potash, and urine, during which they ferment and become reddish and afterwards blue; the chalk and other solid matters are then added, and the litmus formed into small cakes in proper moulds. Sir R. Kane states that litmus consists of several principles, the chief being erythro-litmin, erythrolein, and azo-litmin which contains nitrogen.

Adulterations.—Litmus is constantly adulterated with indigo, which is shown by digestion in pure oil of vitriol, by which a blue solution is got; and, if heated between two watch-glasses, indigo vapour is evolved, and crystals of indigotin become sublimed.

Uses.—It is only employed to prepare the tincture, and litmus paper for testing.

TINCTURE OF LITMUS.—This solution is of a fine blue colour; but, if preserved for some time in bottles from which the air is excluded, it becomes colourless, and regains its bright tint on again exposing it to the air. It is employed for making litmus paper.

PREPARATION.—Litmus, in powder, ℥j.; proof spirit, f℥x. Macerate for seven days, and filter.

BLUE LITMUS PAPER.—Is got by steeping unsized paper in tincture of litmus, and drying it by exposure to the air; it should have a uniform purplish-blue tint, and is used to detect acids or acid salts, which produce with it a red coloration.

RED LITMUS PAPER.—Is obtained by steeping unsized paper in tincture of litmus which has been previously reddened by the addition of a very minute quantity of dilute sulphuric acid, and drying it by exposure to air; it is a valuable test for all alkaline preparations, which restore its blue coloration.

THALLOGENS (ALGÆ).

ALGÆ.—Cellular flowerless plants, living in water, and absorbing nutriment by their entire surface; propagation effected in various modes, by division of the endochrome, by spores or zoospores, or by special jointed parts; sexes often distinct; the spermatozoids very rarely, if ever, spiral, furnished with flagelliform appendages. (According to the olive, red, or green colour of the spores, the algæ are subdivided into Melanospermeæ, Rhodospermeæ, and Chlorospermeæ; the plants belonging to the first division are of interest, as affording the principal sources of KELP.)

CHONDRUS CRISPUS.—IRISH MOSS.—The Carrageen of commerce is obtained from various species of *Chondrus*, dried and bleached by exposure to the air and light. It is principally gathered on the western seacoasts. It consists of dry crisp yellowish-white fronds, which are inodorous, and taste mucilaginous; it swells up with warm water, and dissolves, if boiled for some time; its mucilaginous constituent is distinguished from gum by not precipitating with alcohol; from starch, by not becoming blue with iodine; and from gelatine, by not being affected by solution of tannin. It is not officinal.

BOTANY.—Fronds from two to twelve inches long, purple, cartilaginous, with numerous wedge-shaped crisped segments; fructification of prominent tubercles, composed of radiated filaments, producing spores, and of tetraspores collected in sori in the substance of the frond.

Uses.—A mucilaginous decoction is made by boiling carrageen, ℥ss., previously well washed, in water, Oiij., for half an hour; a jelly is obtained by using a larger quantity of the seaweed. Its properties are those of a simple bland demulcent; it is popularly employed for diseases of debility, and, as it has no taste, can be flavoured with sugar or aromatics, to render it more agreeable.

Dose.—*Ad libitum.*

GLYCERINUM ($C_6H_8O_6$).—Glycerine.—This liquid, when pure, is colourless, of thick oily consistence, free from odour, and having an intensely sweet taste; it is perfectly miscible with spirit of wine or water in all proportions, and dissolves most of those salts that are soluble in water nearly to the same extent that they are capable of melting in that fluid; when heated to 212°, it volatilizes slightly, and when continued heat is applied becomes converted in great part into acrolein, giving off intensely pungent and irritating vapours, though it can be distilled unchanged in a current of steam heated between 500° and 600°. Its sp. gr. is directed to be 1·26; the purest glycerine reaches sp. gr. 1·27 when most concentrated; that which is usually sold as Price's glycerine has sp. gr. 1·25, and is the most reliable article for medical purposes, as it is always free from those traces of lead that are commonly present in other preparations.

Glycerine is separated from oils during the process of saponification; it appears to exist in union with the fatty acids in the form of an oxide of a compound radicle, designated by Berzelius lipyl, which assimilates the elements of water, when it becomes free and generates glycerine; according to Löwig, who terms the base glycil, C_3H_2, the reaction consists in its combining with oxygen and the elements of water, $2\,C_3H_2 + 2\,O + 4\,HO = C_6H_8O_6$. It was originally obtained by saponifying oily substances, and particularly as a residue after preparing litharge plaster; but the separation of the traces of lead which it dissolves is so difficult, and there is so much risk during the purification of developing acrolein, that this method is now never adopted. When fatty bodies are subjected to the action of steam at high temperatures under pressure, they are decomposed, the fatty acids become eliminated, and glycerine in an extremely pure state subsides into a heavy stratum underneath; it is drawn off, and carefully evaporated, and when of sp. gr. 1·24 contains four per cent. of combined water; if further concentrated to 1·26, it still retains two per cent. of this water.

Purity.—When glycerine is used in medicine, it requires to be examined to ascertain its freedom from salts of lead and from chlorides; if rubbed to the hand, it ought to remain totally free from all unpleasant mouse-like smell, which would be caused by the occasional presence of fatty volatile acids. I have known uncrystallized grape sugar sold instead of glycerine: this substitution is of course unjustifiable, as it is perfectly worthless as a remedial agent.

EFFECTS.—Glycerine is employed in medicine with two distinct objects: primarily it operates as a local emollient; and it is still more useful as a solvent and vehicle for different energetic substances. Its effects appear to depend on its property of preserving the part that it is applied to constantly moist; thus it is used to tender and excoriated surfaces, for fissures of the nipples or lips, as a mild dressing for blisters or recent superficial burns, and to the face after exposure to excessive heat of the sun, or when suffering from the eruption of small pox. In some forms of deafness depending on a morbid dryness of the tympanum, or when that membrane has been destroyed, a small portion of cotton wool moistened with glycerine has the effect of restoring the power of hearing, at least for a time. Glycerine is also occasionally added to ordinary poultices to keep them damp, and to lotions and washes to prevent their rapid desiccation; it is not properly miscible with the fixed oils or greasy unguents, separating from them after a time like drops of water. A PLASMA OR GLYCEROLE is frequently made use of, which resembles thick arrowroot jelly; it adheres perfectly to the skin, and can be employed as an efficient and cleanly poultice to delicate surfaces, which it will preserve constantly moist, and free from scabs or purulent incrustations; it also relieves the distressing heat and itching of many eruptive affections, and presents several special advantages over ointments; thus it gives off no unpleasant odour, and is miscible with water, and therefore readily detached by washing; it produces none of those stains and discolorations of the linen which are liable to result after greasy applications, and it forms an excellent vehicle for applying other active remedies; but it is difficult to preserve for any lengthened period, and is liable to become covered with mould when exposed to the air. It is prepared by blending sixty grains, or upwards, of potato starch or arrowroot with a little water, adding glycerine, f℥ij., triturating them together, and gently heating until they combine, forming a soft translucent mass.

M. Demarquay, it is right to state, claims for glycerine certain medical properties which, if established, would prove of great value in practice; he asserts that it has the effect of diminishing the quantity of purulent exudation discharged by ulcers, and that it can materially modify the unhealthy character of many secreting surfaces.

As a solvent for other substances, glycerine is of the utmost value, and it is impossible at present to limit the numerous applications for which it can be made available. When medicated by dissolving alum or tannin, or by the addition of an equal quantity of brandy, it is of special service in healing excoriations and superficial fissures of the lips, or female breast during lactation; with borax it forms a good lotion for tender and discharging surfaces, and for treating the impetiginous rashes of infancy; a similar wash is also frequently employed for cleansing the hair; when mixed with subacetate of lead, it constitutes an efficient dressing for eczematous eruptions, and other affections where preparations of lead are indicated. It dissolves iodine and iodide of potassium in every proportion, and lotions can therefore be made of any desirable strength, which are preferable for external use to spirituous solutions, the absorption of the iodine being favoured by the persistent moisture of the glycerine. It ought not to be added to acid nitrate of mercury, unless when intended for speedy use, as after a few days it decomposes this salt, and deposits metallic mercury; and it is well to be aware, that, if dropped into a mixture of concentrated nitric and sulphuric acids, glycerine will form a heavy oily compound, termed nitroglycerine, that is highly explosive, and appears further to be a dangerous poison.

Creasote, carbolic acid, and tar, are all soluble in glycerine, and mix thoroughly with the plasma of starch, forming useful applications in cases of psoriasis and of inveterate lichen. Glycerine has been recommended for internal use in the treatment of phthisis, and other diseases of debility, as a substitute for cod liver oil; but, after a fair trial of its effects, it cannot be considered deserving of much confidence for this purpose.

DOSE.—From fʒj. to f℥ss., can be given three or four times during the day.

ELEMENTS OF MATERIA MEDICA.

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PART III.

ANIMAL MATERIA MEDICA.

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ANIMAL MATERIA MEDICA.

The substances of animal origin used for medical purposes are so limited in number, that it is unnecessary to observe any strict method of classification in their arrangement. We find that the following Classes of the Animal Kingdom contribute more or less to the list :—

Acrita.—Animals not possessing a nervous system, or distinct organs of sense, and frequently devoid of a true alimentary canal; in general of aquatic habit, and reproduction often accomplished by fissuring or gemmation. Example :—Sponges.

Articulata.—Skeleton exernal; nervous system ganglionic, arranged in a double series along the ventral surface; the principal or cerebral mass situated above the œsophagus; organs of sense symmetrical, and circulation incomplete. Of this class the insects are represented by three suborders; and the annulosa by the medical leech.

Annulosa.—Examples :—Sanguisuga medicinalis and officinalis.

Insecta.—*Coleoptera.* Examples :—Cantharis vesicatoria; Mylabris chicorii and M: sidæ.
Hemiptera.—Example :—Coccus cacti.
Hymenoptera.—Example :—Apis mellifica (affording wax and honey).

Vertebrata.—Skeleton internal; nervous system cerebro-spinal; organs of sense arranged symmetrically in a longitudinal series; circulation complete, with red blood. In this class we have representatives of the

Pisces.—Examples :—Acipenser (yielding isinglass); Morrhua vulgaris (the source of cod liver oil).

Aves.—Example :—Gallus Banckiva (the egg, to obtain albumen).

Mammalia.—Examples :—Physeter macrocephalus (for affording spermaceti); Moschus moschiferus (the source of musk); Castor fiber (yields castor pods); Sus scrofa (the purified fat or lard); Bos taurus (affording ox gall, milk, sugar of milk, and pepsin); Ovis aries (the purified fat termed suet).

SPONGIA.—SPONGE.—Consists of aggregations of animals belonging to the *Acrita*, or those creatures that are destitute of nervous system, definite organs of sense and circulation, or muscular structure; they consist of soft gelatinous or amæbiform tissue, traversed by anastomosing canals, through which water is absorbed, and again discharged by larger vents, many of the species developing calcareous or siliceous spicules; and, so far as we yet know, they are reproduced by ova and spermatozoa.

Several descriptions of sponge are known in commerce, chiefly obtained in the Mediterranean and Red Seas, and from the West India Islands. The finest sponge is soft, close-grained, and tough, of pale yellow colour; inferior kinds are harsh, with large apertures or honeycombed, and easily torn; they often present a reddish-brown hue. When obtained from the ocean, sponge abounds in gelatinous material, which requires to be perfectly washed out before it decays.

USES.—The properties of sponge are well understood, and do not require description. It was formerly burned and given in powder as a remedy for goitre, for which purpose it is now totally replaced by iodine and its preparations.

PREPARED SPONGE is employed for dilating sinuses and small apertures; it is got by immersing sponge in wax, and drying it whilst compressed. For many surgical uses it can be well replaced by the dried stems of seaweed, particularly *laminarias*, some of which are now employed for making distensile bougies, &c.

HIRUDO.—THE LEECH.—This animal belongs to the articulate subdivision of the Animal Kingdom, in which the body consists of repeated annuli, with the muscles attached to the inner surface of the skin; and the nervous system is composed of ganglia, disposed in pairs along the ventral aspect, joined by two nerve cords, commencing superiorly in two ganglia, one above and the other below the œsophagus.

The leech consists of an elongated body, narrower anteriorly, two or three inches long, composed of about ninety-five distinct rings; the extremities terminate in suctorial disks; the anterior one has a triradiate mouth, furnished with three cartilaginous jaws, armed with small teeth, which cut like fine curved saws; the eyes are ten, minute, disposed on the upper lip. Leeches are androgynous, effecting mutual impregnation, and usually producing each two cocoons from which the ova, twenty to thirty in number, are hatched after nearly four weeks. The male organs of reproduction are situated on the twenty-fourth ring, and the female parts about five rings lower down. The œsophagus is short, terminating in a stomach that extends over two-thirds of the length of the animal; it gives off several cæcal cavities on each side, the two last being much the largest; the intestine is about an inch in length—it is divided into two parts, the small and large intestine, and ends in an aperture upon the dorsal surface of the last ring. The leeches which are used in medicine principally belong to the following species :—

Sanguisuga Medicinalis.—The Grey or Speckled Leech.—An inhabitant of the northern parts of Europe, and some portions of Africa. The body is olive-green coloured, with six rusty-red longitudinal stripes along the back; the belly yellowish-green, marked with black spots, which vary considerably in size and number.

S: Officinalis.—The Green or Official Leech.—Chiefly got in the south of Europe. The body is dark olive-green, mixed with grey, having six rusty-red stripes along the back; the belly paler green, and unspotted.

S: Interrupta, vel Troctina.—The Dragon or Trout Leech is found in Algeria and Barbary. The body is clear brilliant green-coloured; the back has six rows of spots; the margins are of orange or reddish colour, and the belly sometimes spotted.

Leeches are captured by the hand, or they adhere to the limbs of the collectors, who follow their occupation in the marshes and swamps where the leeches breed. They are at present imported in great quantities from Eastern Europe, and are subject to several diseases, which render their preservation precarious and difficult. Several attempts have been made to keep them in aquaria; but none of these plans have come into general use: they are generally preserved in glass vessels partially filled with water, which is changed at intervals as it becomes soiled or stagnant, every three or four days in summer, and about once a month during winter.

Uses.—When a large number of leeches are applied at once, they produce all the effects of general bloodletting, and are frequently thus used in tropical climates to treat acute diseases, which would run a rapid course unless promptly arrested. They are invaluable for removing blood from inflamed parts, and are particularly of service in those situations where cupping cannot be employed, or is objectionable from the disfiguration resulting from the marks of the incisions: thus they are used to the temples, the orbits, breasts, around the anus, &c.; they also enable us to keep up a continued drain of blood from an inflamed surface, by applying a succession of leeches in small numbers to the part; this practice is useful in some cases of croup and of laryngeal disease, and other acute local inflammations. I do not think that a leech draws more than fʒij. to fʒiij., on an average, exclusive of the quantity which flows away from the incision after it falls off, and which is liable to extreme variation in amount, and may become so excessive that the loss from a single leech bite is quite capable of destroying the life of a young child when neglected, or at the least of inducing protracted and dangerous weakness for months afterwards. It is therefore far safer, when leeching children, to direct that the bleeding shall be perfectly checked before leaving the patient; this is best effected by continued pressure, applying first a minute fragment of lint to the point, or a little matico in powder. I have used graduated compresses in some instances with good results; caustics of all kinds should, if possible, be avoided. I have seen the simple nitrate of silver, which is usually a safe application, cause a slough that degenerated into a spreading and unhealthy sore: in positively dangerous hæmorrhage from a leech bite a fine needle should be passed well underneath the bleeding point, and a twisted suture applied over it; this, however, can only be necessary in exceptional cases. When leeching children, it is a safe rule always to apply the leeches over solid bony parts, against which pressure can be used if necessary, with some firm resistance; thus, in diseases of the throat, the best place for them is the upper part of the sternum. Leeches cause permanent triradiate markings in the skin, more obvious where the surface is thin and delicate, which is a serious objection to applying them on any part of the face, or upper portion of the chest with females.

To make leeches adhere, the skin should be washed perfectly clean, at first with soap and water, then with soft water, and dried; the leeches are immersed in clean warm—not hot—water for a few minutes, gently rubbed in a dry towel, and laid on the skin, when they usually fasten at once. Some recommend to apply milk, or a little recently drawn blood, which is seldom necessary. The smell of tobacco smoke in a room appears to prevent them from taking.

Leeches will disgorge the blood they have taken through their mouth, if gently pressed between the fingers; vinegar or salt is often employed for this purpose, but injures the animal.

COLEOPTERA.—Insects, possessing four wings, of which the two anterior are horny, forming elytræ or wing cases, the lower wings folded longitudinally; mouth provided with mandibles and jaws.

CANTHARIS VESICATORIA.—THE SPANISH FLY.—Is collected in the South of Europe, chiefly from Sicily, Hungary, and Russia, where it abounds on the ash, lilac, privet, elder, and other trees; it also occurs, though rarely, in England. In its perfect form as a winged insect, its life is stated usually not to exceed eight or ten days; and whilst living it exhales a nauseous, offensive odour. Cantharides are caught during the months of May and June, before the rising of the sun, or late in the evening, when they are torpid, by shaking them off the trees into large cloths, and the persons thus engaged are obliged to protect their hands and face with gloves and veils. When captured, they are gathered into sieves, and killed by plunging them into hot vinegar and water, and then dried in stoves, or by exposure to the air, and packed in casks for exportation.

Each insect is from eight to ten lines long; of elongated cylindrical shape, weighing about a grain and a half, furnished with two metallic golden green elytræ, under which are the thin membranous folded wings; the antennæ are black and filiform; the body and limbs bright bluish-green, and shining. When pulverized, the resulting powder is greyish-brown, and presents numerous glistening particles, which are perfectly distinctive, and have often served to recognise the insect in cases of poisoning by its administration, in some instances even when months had elapsed after interment. The analysis of cantharides affords a fatty oil, animal constituents of minor importance, and the crystalline principle, cantharidine ($C_{10}H_6O_4$?), which also exists in other vesicating insects. Gmelin regards it as a concrete volatile oil; it slowly crystallizes in acicular form by evaporating a concentrated alcoholic tincture, is soluble in ether, alcohol, chloroform, or oily substances, but when pure not dissolved by water, though volatile at low temperatures, and often causing irritation of the eyes and face of those who experiment with it, and vesicating energetically when applied to the skin, even in minute quantity. In the south of Europe and India, the *Mylabris chicorii* is in ordinary use as a substitute for cantharides; it is about two-thirds its size, the elytræ obscure yellow, marked with transverse black bands. Another large species, the *M: sidæ,* of China, has of late been largely imported, and considered more active than the cantharis; its elytræ are of reddish-brown colour, transversely marked with black. According to the experiments of Berthoud, cantharides afford about one part of cantharidin in 1000, and more abundantly from their softer parts.

Adulterations.—Cantharides, in powder, are frequently sold mixed with a portion of the acrid resin, euphorbium. This is recognised by dissolving it with boiling proof spirit, and filtering whilst hot; as the solution cools, it deposits any of the resin that is present. When carelessly preserved, the blistering insect deteriorates, and loses all its activity; though it may be kept for indefinite periods in closed vessels, if thoroughly dried: it is liable to be attacked by several small insects, which devour even the elytræ; a minute mite is very common. Pereira recommends the addition of a few drops of strong acetic acid as an effectual remedy, or camphor is used, which is also serviceable in killing moths; it fails with the *Anthrenus muscorum,* a small beetle that is most destructive; and to guard against this, Soubeiran advises a little mercury to be placed in the bottom of the bottles.

Effects.—Large doses of cantharides cause dangerous irritant symptoms; they are sometimes ignorantly administered under the idea of exciting sexual passion, and have too often destroyed life: a female has died after taking twenty-four grains of the powder, and f℥j. of the tincture has killed a youth, aged seventeen years. It excites burning pain in the throat and stomach, tenderness, constant thirst, and vomiting, incessant contraction of the bladder, lumbar pain and desire to pass water, hæmaturia, purging like dysentery, with vertigo, difficulty of deglutition, convulsions, syncope, or even gangrene of the intestines and genitals.

Administered in the ordinary medical doses, cantharides will operate as a diuretic, and has been used to remove dropsies, particularly when depending on disease of the heart; but its action is considered uncertain; it has also been recommended for chronic discharges from the urethra, resulting from neglected gonorrhœa, and in the incontinence of urine that occurs with young persons during sleep; as this affection is usually dependent on constitutional debility, it is better cured by good diet, warmth, tonics, and other means which improve the general state of the health. Severe attacks of chronic eczema and of lepra, especially when they appear in females, are often treated in the manner recommended by Biett, giving tincture of cantharides in five-drop doses, gradually increased to ten or upwards, combined with moderate quantities of Fowler's arsenical solution. The aphrodisiac properties attributed to cantharides are never observed unless after using dangerous and excessive doses, and then as a secondary result of their influence in irritating the urinary organs.

Applied externally, preparations of cantharides can be employed to produce erythema, to vesicate, or to establish purulent discharge. Rubefaction is excited by the use of embrocations containing either the tincture, or the liniment which must be largely diluted; or by the ordinary warm plaster. Such stimulating liniments are rubbed to the skin to relieve rheumatic and other local pains, for chronic bronchitis, and in threatened tubercular disease of the lungs; and washes or pomades, into which cantharides enter, are largely relied on in cases of incipient baldness, to promote the growth of the hair; whilst warm plasters are of service in lumbago, pleurodynia, and recent catarrhs.

When a blister is applied for a short time, it stimulates the capillary circulation, and causes redness; such flying blisters are useful in the diseases of early life, and for the intercurrent pulmonary congestions of continued fevers. After a period of four to eight hours, vesication ensues, usually without pain; and if the cuticle is not removed, the serum is soon absorbed, or escapes, and the surface heals within two or three days; the counter-irritation and slight derivative action thus induced are advantageous in inflammatory attacks, after the acute symptoms are subdued, or have passed into a chronic stage; but much mischief may result from applying blisters too early, especially with children, or in pulmonary affections, when they are liable to cause a renewal of the diseased action. In bronchitis, the proper period for blistering appears to be that stage where stimulating expectorants are of service, and then they should be made of sufficient size to produce decided results; petty blisterings only irritate the patient, and are worthless as remedies. In pleurisy, repeated vesications assist in absorbing effused fluid; and in cases of phthisis, where the disease is limited, blisters under the clavicle in the early stages relieve local irritation, and retard softening; they also assist to remove the localized pleuritic stitches that are sometimes so distressing to the patient.

In abdominal diseases blistering is employed for cases of chronic peritonitis, or in the latter stages of dysentery; and I have known them of great benefit in attacks of subacute cystitis, and in painful ulcerations of the cervix uteri, applied to the hypogastric region. In applying blisters to the head, they ought not, if possible, to be placed upon the occiput, where they prevent the patient from sleeping with comfort; this is particularly necessary to be observed in the latter stages of fever with delirium, wakefulness, or threatened stupor; in apoplectic attacks they are indicated when counter-irritation is necessary; but their use as a routine mode of treatment must be objected to.

Where it is desired to excite suppuration, the blister must remain on for a considerable time; the cuticle is then removed, and the cutis dressed with some stimulating ointment; this is useful in chronic inflammations, to disperse glandular tumors, bubos, &c., and to the temple or vertex in amaurosis and threatened cerebral attacks. For blistering young children, two or three hours are sufficient; a piece of thin unglazed paper is often placed between the skin and the blister, or a layer of fine muslin; after removing the plaster the part is dressed with a poultice or mild ointment, and perfect vesication soon occurs; when blisters are neglected, they are liable to run into gangrene; their use appears particularly dangerous after febrile eruptions, such as measles. The strangury that occasionally results from blistering is best relieved by the free use of diluents, and small doses of liquor potassæ.

Antidotes.—The cantharides should be removed as soon as possible from the stomach, after which emollient and mucilaginous drinks and opiates appear to be our best treatment.

Dose.—From half a grain to two grains, reduced to fine powder; it can be given in pill; but the tincture is preferable for internal use.

TINCTURA CANTHARIDIS.—**Tincture of Cantharides.**—This tincture is occasionally applied with liniments to produce rubefaction; and, though rather weak, is a convenient formula for internal use; full doses will cause strangury, which serves as an indication for immediately discontinuing its employment; in chronic gleety discharges it is often combined with muriated tincture of iron, and in cutaneous eruptions with the preparations of arsenic. It is frequently termed tincture of lytta; each fʒj. is equivalent to about three-fourths of a grain of cantharides.

Dose.—For the adult, fʒss. to fʒj., three times in the day, given in some emulsive fluid, and after meals.

Preparation.—Cantharides, in coarse powder, a quarter of an ounce; proof spirit, Oj.; prepared by macerating and percolation, similar to tincture of aconite.

LINIMENTUM CANTHARIDIS.—**Liniment of Cantharides.**—This is an ethereal solution of cantharidine, only intended for external purposes, to produce rapid vesication, for which object it is painted repeatedly over the part with a camel hair pencil. The acetic acid employed is not sufficient to damp all the cantharides thoroughly; and, whilst subsequently percolating with ether, precautions should be taken to use such an apparatus as will prevent its loss by evaporation. There are good grounds for believing that much of the active principle contained in the flies remains unexhausted.

Preparation.—Cantharides, in powder, ℥viij.; acetic acid, f℥iv.; macerate for twenty-four hours; then place in a percolator, and allow ether, Oj., slowly to percolate until f℥xx. are obtained; keep it in a stoppered bottle.

VESICATING COLLODION.—Is a useful application for producing blisters, and easily applied of any required strength; it is used with facility to irregular surfaces, unsuited for ordinary blistering, and has the advantages of being neat and cleanly. It requires to be brushed over the part once or twice with a camel hair pencil.

Preparation.—Dissolve in liniment of cantharides, forty-eight parts, pyroxylin, one part; and after subsiding, pour off the clear fluid from any sediment that deposits.

EMPLASTRUM CANTHARIDIS.—Cantharides Plaster.—Or blistering plaster, should be spread without employing heat; and, when applied to the skin, preserved accurately in contact with it until it causes vesication; this usually takes place, when the plaster is of good quality, within four to eight hours, the blister continuing to rise for some time afterwards. In those cases where it is not intended to induce suppuration, the secreted fluid is discharged by cutting the vesicles, and the cuticle ought to remain; after which some mild cerate is used for dressing, spread on lint, or, better still, a layer of soft cotton wadding is laid over the part, which then rapidly heals in the course of two or three days, seldom causing much pain or inconvenience if the cotton is allowed to remain undisturbed. Where it is intended to excite prolonged discharge the cuticle is detached, and the exposed cutis dressed with any irritating ointment, as savin or unguentum cantharidis; and it is also necessary to remove the cuticle when we desire to apply mercurial ointment after blistering. When the irritation caused by topical applications becomes excessive, they require to be replaced by a soft bread and water poultice. In blistering young children, a thin layer of tissue paper is often placed between the skin and the blister; it is permitted to remain on for only three or four hours; and when removed, the part is dressed with cotton or cerate, leaving the vesications unbroken. As already mentioned, there is considerable danger of gangrene resulting when blisters are applied to delicate children in the course of measles, or other febrile eruptions.

Preparation.—Yellow wax, ℥vijss.; prepared suet, ℥vijss.; prepared lard, ℥vj.; melt in a steam or water bath, and add resin, ℥iij., previously liquefied. Remove from the bath, and before they solidify add cantharides, in very fine powder, ℥xij., and mix by stirring briskly.

UNGUENTUM CANTHARIDIS.—Cantharides Ointment.—Is used to promote a discharge from blistered surfaces, or applied rolled on issue peas to stimulate secretion in chronic ulcers or issues; it is frequently mixed with an equal proportion of savin ointment.

Preparation.—Cantharides, ʒj.; olive oil, fʒvj.; digest in a covered vessel for twelve hours; then place the vessel in a water bath at 212° for fifteen minutes; strain through muslin with strong pressure; add the product to yellow wax, ℥j., previously melted, and stir constantly till the mixture solidifies.

EMPLASTRUM CALEFACIENS.—Warm Plaster.—A useful external application in chronic rheumatic pains, catarrhal attacks, lumbago, and other cases where warmth and mild counter-irritation are required; for persons with tender and easily blistered skins, it requires to be diluted with one to three parts of Burgundy pitch, or soap plaster. It can be spread on thick calico, or soft leather, with a heated iron.

Preparation.—Cantharides, in coarse powder, ʒiv.; boiling water, Oj. Infuse for six hours; squeeze strongly through calico, and evaporate the expressed liquid by a steam or water bath till reduced to one-third; then add expressed oil of nutmeg, ℥iv.; yellow wax, ʒiv.; resin, ʒiv.; soap plaster, 3¼ pounds; resin plaster, 2 pounds; melt in a steam or water bath, and stir well until the whole is thoroughly mixed.

Hemiptera.—Insects; mouth suctorial; elytræ in some semi-membranous, in others resembling wings, but thicker, and more extended.

COCCUS CACTI.—The Cochineal Insect.—Is found in the woods of Mexico, but for commerce is extensively propagated artificially, and has been introduced into Teneriffe, Java, Algiers, and other warm climates. It feeds on the nopal, or *Opuntia coccinellifera*, which requires to be planted at regular intervals in an open situation where it is sheltered from west winds, the plantation seldom exceeding two acres in extent. A few female insects are placed on each plant about April; the larvæ are soon developed, and spread themselves over the plants, from which they are collected at intervals during the subsequent summer, by brushing them off softly, and gathering the produce in cloths,—those which are first obtained being most valuable, and yielding the finest colour. The insects are killed in several ways, principally by steeping them in hot water, and are then dried in a free current of air; it requires from 40,000 to 60,000 insects to weigh one pound. The female cochineal is always gathered; it is at least twice the size of the male, one or two lines long, wrinkled, and convex superiorly, with very small limbs; its taste is bitterish, and it tinges the saliva of a bright violet-red hue. The finest cochineal is purplish-grey coloured, covered with a whitish powder; inferior varieties are small, dark-coloured, and want the silvery appearance of the better descriptions. The male insect is so dissimilar, that it is more like another species; it is smaller, elongated, with two long wings, and the abdomen terminates in two prolonged diverging setæ. The habits of the male animal are extremely active; it dies speedily after impregnating the female, who lives for about a month longer, becoming greatly enlarged by the development of the ova; when the time approaches for laying the eggs, she fixes herself to the plant, and after their extrusion the parent insect also dies, and becomes shrivelled, her skin serving as a protection to her offspring. The eggs, which vary from 250 to 300, are hatched after a short time; the larvæ traverse the plant for a few days, and then settle themselves, rapidly increasing in size. The brilliant colouring matter got from the cochineal insect, termed carmine, is purplish-red; it fuses at 112°, is insoluble in ether, but readily dissolves in water or alcohol; precipitated with hydrate of alumina, it constitutes the well-known colour, lake. According to De la Rue, pure carminic acid consists of $C_{28}H_{14}O_{16}$.

Adulteration.—The genuine insects have been rolled with solution of gum, and then in powdered sulphate of barytes, to increase their weight; and, stranger still, artificially moulded imitations of this valuable substance have been attempted.

Uses.—Cochineal is only employed for purposes of colouring; it is popularly given with carbonate of potash in solution, for curing hooping cough; its effects are worthless.

TINCTURA COCCI.—Tincture of Cochineal.—Added to mixtures, to impart a red coloration.

Dose.—fʒj. or fʒij. will suffice for an eight-ounce mixture.

Preparation.—Cochineal, ℥ijss.; proof spirit, Oj. Macerate for seven days; strain, express, and filter; then add sufficient proof spirit to make Oj.

Hymenoptera.—Insects; mouth consisting of mandibles, serving with the tongue for suctorial purposes; wings four, of unequal size, naked and veined; females with an ovipositor, or sting; undergoing a perfect metamorphosis.

APIS MELLIFICA.—The Honey Bee.—This insect is of interest merely as the source of honey and wax, both of which substances are officinal.

Mel.—Honey is the saccharine juice of flowers, absorbed by the bee, and again disgorged from the œsophageal dilatation, or honey-bag, probably somewhat altered in its properties; it consists, when recent, principally of fructose or uncrystalline sugar; and when kept, becomes converted in great part into glucose, or grape sugar. With some persons it is liable to disagree and cause diarrhœa, and can be used as a gentle laxative; in certain instances it has produced symptoms of poisoning, in consequence of having been collected from poisonous flowers, particularly *Azaleas* and *Kalmias*.

Adulteration.—Strained honey is liable to be adulterated with water; or starch, and different descriptions of flour, which produce a blue colour on adding tincture of iodine; it is more difficult to detect the presence of starch sugar, which is said to be recognised by its peculiar taste.

MEL DEPURATUM.—Clarified Honey.—By straining, wax is removed, and the honey is supposed to become less disposed to ferment; its flavour is not improved by the process: it is used for preparing "mel boracis."

Preparation.—Honey, lb. v. Melt in a water bath, and strain, while hot, through flannel previously moistened with hot water.

MEL BORACIS.—Borax Honey.—A favourite application to aphthous affections of the mouth and throat, and sometimes added to gargles for ulcerations of the fauces.

Dose.—℥j. or ℥ij., can be mixed with an eight-ounce gargle.

Preparation.—Borax, in fine powder, gr. lxiv.; clarified honey, ℥j. Mix.

CERA FLAVA.—Yellow Wax.—Several vegetables produce a substance similar to bees' wax in appearance and composition; but it is now usually admitted that the bee secretes this substance from eight small abdominal pouches, whence it is collected by the posterior legs of the insect into dilatations situated upon the first joint of the tarsus. According to Dufour, the working bees elaborate wax from their vegetable food, and gather it from the mouth in a pulpy condition; he denies the existence of special abdominal glands. For commercial purposes, bees' wax is melted with water, and the impurities allowed to subside; it is then strained off, and consolidates in large cakes; great quantities are imported from Africa, the West Indies, and other tropical regions.

Cera Flava.—Or ordinary yellow wax, has a peculiar agreeable odour; its colour varies from pale yellow to deep brown; it breaks with a granular fracture, melts at 145°, and has a sp. gr. between 0·960 and 0·965.

Cera Alba.—White wax is obtained by melting ordinary wax, and allowing it to run out into water, so that it forms thin ribbons or layers, which are bleached by continued exposure to the air and light in a bleachfield, or it is subjected to the action of dilu[illegible]itric acid; but the former process gives a preferable result, though more tedious; the wax is then remelted with some water acidulated by dilute sulphuric acid, which further purifies it, and run into moulds. It is opaque yellowish-white, tasteless, without odour, and brittle, melting at about 158°; of sp. gr. 0·82 to 0·96.

Wax consists of three different substances, which are distinguished by means of alcohol. Myricin, $C_{92}H_{92}O_4$, constitutes about two-thirds of it, and is considered analogous to spermaceti, or to Chinese wax, being insoluble in alcohol. Cerolein dissolves, and remains permanently in solution; it constitutes only four to five per cent. of the wax, and has been imperfectly examined. Cerotic acid, $C_{54}H_{54}O_4$, forms about twenty-two per cent. of the weight, but its amount varies; it is soluble in boiling alcohol, and crystallizes out as the fluid cools.

Adulterations.—Yellow wax is sometimes mixed with suet, which gives it a fatty disagreeable taste; starch or flour is detected by boiling in water, and testing the liquid with iodine, which should produce no blue coloration; these additions also are insoluble in turpentine, in which wax completely dissolves; resin is recognised by being soluble in rectified spirit.

Uses.—Wax is only employed for imparting consistence to cerates; it was formerly given internally, made into emulsion, for chronic diarrhœa and ulcerations of the intestine.

ICTHYOCOLLA.—Isinglass.

—Is obtained principally from the swimming bladder of different species of sturgeon, *Acipenser*, prepared for commerce in several ways. Thus, it is either dried in an unopened state; or laid open, and often folded, compressed, or cut into thin shreds. Several distinct trade varieties are known, according to the localities from which the isinglass is imported; the principal of these are Russian and Siberian districts, and from Hudson's Bay. The best isinglass is considered to be that which has least fishy odour, is most soluble in boiling water, and forms the clearest jelly when dissolved; but the finest descriptions always afford a small portion of insoluble material, derived from the thin inner lining membrane of the sac. It consists essentially of animal substance, which affords gelatine of an extremely pure character, and hence its aqueous solution soon putrefies.

Adulteration.—Some form of animal gelatine, cut into thin shreds, is occasionally mixed with isinglass; and the ingenious process has even been adopted of rolling out gelatine between layers of genuine isinglass before cutting it. When macerated in cold water, they soften and swell, but the isinglass remains opaque, whilst animal gelatine becomes much more translucent than before.

USES.—Isinglass is officinal for forming a test solution, which precipitates with tannin; it is extensively employed to clarify wines and other liquids; and for dietetic purposes, it is usually made into jelly, as a substitute for calves' feet, for which purpose ℥ss. will suffice for upwards of Oj. of fluid; it presents no advantages over other gelatinous articles of food, and cannot be considered of much service in affording nourishment.

SOLUTION OF GELATINE.—Is employed to test tannin, with which it produces an immediate flocculent precipitate.

PREPARATION.—Isinglass, in shreds, gr. l.; warm distilled water, f℥j. Mix, and digest for half an hour on a water bath, with repeated shaking; and filter through clean tow, moistened with distilled water.

OLEUM MORRHUÆ.—COD LIVER OIL.—This oil is directed to be prepared from the fresh livers of the ordinary cod, *Gadus morrhua;* it is also got to a large extent from several allied species, particularly from the hake, coal fish, dorse, haddock, and ling, which are all closely related fish, so that their substitution for the genuine cod can hardly be objected to. There are several ways by which the oil is obtained: the finest descriptions are got by employing the livers in as fresh a condition as possible, and washing them with clean water to remove blood or other impurities; they are then placed in a large vessel, and subjected to the action of a jet of steam, which parboils the livers, breaks down their structure, and permits the oil to drain out; it is then gathered, and separated from any water which subsides, and filtered. Another plan is, to heat the livers in a water or steam bath at a temperature not exceeding 150°, and collect the oil that gradually oozes out; this is the mode directed in the Pharmacopœia, and affords a fine pale-coloured product. When the livers are kept, they soon decay, and the oil acquires a darker colour, varying from pale brown to dark brown, and has more or less a strong fishy odour, and unpleasant taste. The oil which flows from the livers when subjected to simple putrefaction in the air is of the darkest tint, has a highly disagreeable smell, and tastes bitter and acrid, leaving an abiding sensation in the fauces. The specific gravity varies from 0·923 to 0·928. In addition to the usual constituents that are obtained from fish oil, it contains some of the elements of bile dissolved in the fatty matters; and hence, if a drop of concentrated sulphuric acid is allowed to fall on the oil, it produces a bright crimson colour; it also affords a small quantity of a phosphorized fat, and minute proportions of iodine and bromine, which exist in a state of intimate combination, so that their presence cannot be recognised until the oil is saponified, and the soap afterwards charred.

ADULTERATIONS.—When selecting cod liver oil, we are guided chiefly by its physical characters: it should be light-coloured, and free from acridity or strong unpleasant smell. It is impossible to detect the substitution of other fish oils; and the red coloration which occurs on adding sulphuric acid is common to all those which contain biliary constituents. Again, when cod liver oil is unusually free from smell, colour, and taste, it is more than probable that it has been mixed with almond oil to give it a false appearance of goodness.

EFFECTS.—This oil was employed in medicine nearly a century since for chronic rheumatism, and gradually became disused; we owe its reintroduction into practice to Professor Bennett, and its value in the treatment of tubercular diseases is now admitted. It requires to be persevered in for a considerable time; and I am disposed to think that moderate doses are most advisable, as they are certainly most likely to agree with the stomach, and to avoid causing disgust to the patient. Some easily tolerate the oil, and even acquire a fondness for it; this often occurs with children, and is a useful indication that it is of service to them; others, unfortunately, feel such a repugnance to it in every form, that they are incapable of using it; and in others it soon excites diarrhœa, so that it must be discontinued. Again, when there is considerable tendency to hæmoptysis, it aggravates the severity of the attacks, and seldom benefits the sufferer. With these exceptions, it is a remedy that proves of the utmost advantage in properly selected cases; it increases the appetite, improves the strength, enables the patient to gain flesh and weight, and strengthens his system to resist the wasting influences of chronic disease; nor is it of service in tubercular affections of the lung alone; it is of use in chronic glandular swellings, tabes mesenterica, scrofulous diseases of the bones and joints, abscesses, and strumous ophthalmia; it has proved particularly beneficial in cases of chronic rheumatism; and has been given with advantage in some obstinate forms of cutaneous eruptions; thus Dr. Banks has employed it internally, and rubbed to the skin in cases of icthyosis, with marked results,—the continued application of the oil for several weeks removing the roughness of the cuticle, and effecting ultimately a perfect restoration to health. The protracted use of frictions with cod liver oil over the abdomen for children affected with mesenteric disease is an excellent mode of treatment; it requires to be persevered in steadily for a considerable time, and the administration of suitable alteratives assists its action.

DOSE.—A dessert to a tablespoonful is sufficient for the adult, given twice or thrice in the day; it is seldom necessary to increase the dose; it may be taken floating on warm milk, sherry, some aromatic infusion, as cloves, or, better still, some mild bitter, as orange peel or gentian: a little common salt, also, taken before and after the oil, will effectually remove its taste from the mouth. Dr. Copland has recommended the fresh livers to be tied up in the stomach of the fish and boiled, and afterwards eaten, whilst warm, with a little salt and spice. For children, the dose is from half a teaspoonful to a dessert spoonful, according to the age.

ALBUMEN OVI.—White of Eggs.—The albumen of the egg of the common or domestic fowl, *Gallus banckiva* of Temminck, is directed for preparing a test solution; it consists of a delicate organized tissue, containing liquid albumen. This substance is distinguished from other animal principles by coagulating on the application of moderate heat; it commences to solidify at 140°; and if the solution is concentrated, as in the egg, soon becomes hard and opaque; it is also coagulated by alcohol, creasote, and the strong mineral acids, which latter, however, after a time gradually decompose and dissolve it. The insoluble compounds that it forms by several of the soluble metallic salts, particularly those of mercury, copper, and silver, render it a useful antidote in poisoning with these preparations. Albumen contains a minute quantity of sulphur; this is easily recognised in stale eggs, by the strong odour of sulphuretted hydrogen which they disengage; in recent eggs it requires to be set free by boiling with solution of potash, and can be subsequently tested with a soluble salt of lead, which it blackens, forming the sulphide. Gerhardt is disposed to consider the white of eggs as consisting of a definite bialbuminate of soda; but the formulæ given for it must be considered only as approximative; taking Lieberkuhn's formula for albumen, it would be represented by ($HO, NaO, C_{144}H_{110}N_{18}S_2O_{42}$, 2 Aq).

The yolk of eggs is an emulsive mixture of oil, suspended in water by means of albumen; its yellow colour is due to an oily substance that contains phosphoric acid, and which readily dissolves in ether. The yolk is used for suspending oleaginous and resinous compounds in mixtures, and for preparing enemata; its nutritive and easily digestible properties render it a suitable article of food in the dietary of invalids, for whom it is often used beaten up with wine or brandy, as in the MISTURA SPIRITUS VINI GALLICI of the former London Pharmacopœia, an excellent stimulant in low fevers, and other cases of debility. This mixture consists of brandy and cinnamon water, of each f℥iv.; the yolk of two eggs; refined sugar, ℥ss.; oil of cinnamon, two minims. Mix.

Dose.—f℥ss. to f℥ij.

SOLUTION OF ALBUMEN.—Is used to test the presence of monohydrated or metaphosphoric acid, HO, PO_5, in the dilute phosphoric acid of pharmacy, which should consist exclusively of the tribasic phosphoric acid, $3\,HO, PO_5$; albumen is instantly coagulated by the monobasic acid, but is unacted on by the tribasic form. It is unchanged, however, by solutions of the metaphosphate salts—the acid requiring to be set free by the addition of some acetic acid. Creasote has likewise the property of coagulating albumen.

Preparation.—Take the white of one egg; distilled water, f℥iv.; triturate in a mortar, and filter through clean tow, first moistened with distilled water. This solution must be recently prepared.

CETACEUM.—SPERMACETI.—Is a substance obtained from the sperm whale, an inhabitant of the Indian and Pacific Oceans—*Physeter macrocephalus*. This enormous mammal often acquires the length of fifty to sixty feet; it is blackish-blue coloured, darker on the back, the under surface and around the eyes being whitish; the head is of large size, especially anteriorly; the upper jaw contains small rudimentary teeth, imbedded in the gum; the lower jaw is narrower and smaller, it has from twenty to twenty-three recurved teeth on each side; the eyes are projecting; there is a single spout hole, instead of two, as in most other cetaceans, and the tail is narrow and conical. Spermaceti is found in several parts of the body, mixed with common fat; it is principally got from the head, where it fills a large cavity in the upper jaw, mixed with oil; this is anterior to, and perfectly separated from, the cavity in which the brain is situated; the chambers in which it is lodged are divided by numerous partitions of cellular membrane and ligamentous septa, the purest spermaceti being got in the smallest cells. After the capture of the whale, the head is opened, and the "head matter" removed in buckets; when placed in casks, it separates into liquid sperm oil, which is drained off, and spermaceti, that is pressed to purify it, remelted, and the fused fat permitted to cool in large crystalline translucent masses.

Pure spermaceti is pearly-white, semitransparent, and glistening, with a crystalline structure; having little taste or odour; insoluble in cold alcohol, but freely dissolved by hot ether, from which it crystallizes on cooling; its sp. gr. is 0·940; it is easily reducible to powder when rubbed with the addition of a few drops of rectified spirit. The composition of pure cetaceum, or cetin, is $C_{64}H_{64}O_4$; it differs from ordinary fatty substances in not affording glycerine when saponified; but a distinct base is obtained, termed ethal, $C_{32}H_{34}O_2$, which is interesting from its peculiar chemical relations, possessing all the properties of a true alcohol, and having the same relation to palmitic acid that wine alcohol has to acetic acid.

USES.—Spermaceti is never employed internally at present, it was formerly considered demulcent, and given in irritations of the bowels and catarrhal affections; it is employed in preparing cerates, in which its only advantage is to impart consistence.

UNGUENTUM CETACEI. — SPERMACETI OINTMENT. — Is used for dressing blisters and excoriated surfaces, as an emollient and cooling application; it also serves to dilute medicated cerates when over-strong; it is essential that this ointment be perfectly free from rancidity or irritating properties.

PREPARATION.—Spermaceti, ℥vj.; white wax, ℥ij.; almond oil, Oj., or a sufficiency. Melt together with a gentle heat, and stir until the mixture solidifies.

Some object to the composition of this cerate, and consider that it is not so well adapted for dressing blisters as the former UNGUENTUM CETACEI of the

Dublin Pharmacopœia. This consisted of spermaceti, lbj.; white wax, lb. ss.; prepared lard, lb. iij., melted together; and when well made is an excellent and satisfactory ointment.

MOSCHUS.—Musk.—Is defined to be the inspissated secretion from the præputial follicles of the *Moschus moschiferus*, or musk deer. It inhabits the mountain ranges of China, Tartary, and Tibet, and is a timid animal, of nocturnal habits; usually about two feet high, with the haunches more elevated than the shoulders, having no horns, and covered with rough greyish-brown fur. The male has two projecting canine teeth, curved backwards, each about two inches long, developed from the upper jaw, which distinguish it from the common deer; it also possesses the peculiar appendage termed the musk sac, which is placed on the abdomen. This is oval, flat on its adherent surface, convex, and covered with hairs on its inferior or free portion, having a smooth depressed aperture communicating with its interior; this opening is about half an inch posterior to the situation of the umbilicus, and usually at the distance of a line or a line and a half farther backwards is the præputial orifice, surrounded by a brush or pencil of elongated hairs. The cavity of the sac contains the musk; the animal, when old, seldom affords much more than about 120 grains, whilst the adult will yield twice or three times that quantity; the pods are each about two inches and a half long, and an inch and three-quarters broad. The most valued description of musk, which is exported from China, is said to be procured in Tonquin, Cochin China, and Tibet; it is preferred when still enclosed in the musk pod, which should be unopened, and covered by the rough stiff greyish hairs that are naturally present on its free surface; these pods are packed in small boxes, which contain about five-and-twenty of them; they are lined with sheet lead, and externally protected by a covering of silk. Grain musk is more liable to be adulterated; it is granular, of reddish-brown colour, and feels unctuous; usually interspersed through it are fragments of the hairs detached from the pods; its taste is bitter and aromatic; its odour is exceedingly powerful, and in quantity often considered unpleasant; it retains this smell for years, and has the remarkable property of augmenting and improving the odour of other perfumes, so that it is largely employed for purposes of perfumery; its smell becomes considerably impaired by admixture with oil of bitter almonds or golden sulphuret of antimony, and is augmented by the addition of a small portion of solution of potash or of ammonia. Those musk pods that are distinguished in commerce as Siberian or Russian are less valued; the odour of the musk that they contain is weaker, and more disagreeable; and the pods are usually stated to be of larger size, though this does not appear to be invariably the case. The different analyses that have been published of musk do not afford satisfactory results. Several fatty principles are obtained from it; the odorous material has never been isolated; and though ammonia can be evolved, this is equally obtainable from several other animal bodies. Rectified spirit dissolves from twenty-five to sixty-two per cent. of musk, and ether is also a good solvent of it.

Adulterations.—Chinese ingenuity is displayed in the sophistication of musk: false pods are prepared from a portion of the animal's skin, sewn so as to imitate a genuine sac, and filled with a mixture of some dried blood and musk; they are recognised by having neither the true aperture for the gland, nor the urethral opening surrounded by its distinctive pencil of hairs, and the sewing is rude, and easily perceived. Earth, sand, gums, and fragments of lead, have all been used; and common turf mould or peat is a frequent addition to grain musk in this country, that is difficult to recognise from the powerful odour of the substance itself.

Effects.—Musk is a useful stimulating remedy, which appears to act specially on the nervous system; though it is seldom prescribed at present. It is used in the treatment of spasmodic affections, as hysteria and chorea; in the advanced stage of fevers accompanied with delirium, hiccup, and twitching of the muscles; for severe erysipelas, in which I have found it of the greatest service, and in several other diseases when they assume a typhoid type; it has been specially recommended to relieve obstinate hiccup; and Trousseau states that it operates as an aphrodisiac.

Dose.—Five to twenty grains is a medium dose, which should be repeated every hour or two; it is best given in mixture, made into an emulsion with mucilage, and combined with diffusible stimulants, ammonia, &c. To children it has been administered with advantage, used in the form of an enema. There is no officinal preparation containing musk.

CASTOREUM.—Castor.—Consists of the præputial follicles of the beaver, *Castor fiber*, dried with the peculiar secretion which they contain, and separated from the somewhat smaller and shorter oil sacs that are frequently imported attached to them: they are brought from North America by the Hudson's Bay Company. Both the male and female beavers are furnished with castor sacs; but the anatomy of the male animal is better understood. There is a common cloaca, situated at the lower part of the abdomen, near the tail, into which the anus and generative organs open; at the sides of the aperture are lodged the oil sacs, and nearer the pubis are the two castor glands, between which the penis is lodged in an elongated præputial canal; none of these parts are perceptible until the external skin is removed; the castor bags are pyriform and compressed, narrower anteriorly, about three inches in length and an inch and a half wide, perfectly distinct from the testicles, with which they have often been confounded from their singular fig-like shape; they are also present in the female, in whom they are less developed, and their relative disposition is as yet imperfectly observed. The castor sacs in a living animal contain a yellow or orange-coloured fluid, highly odorous, and even fœtid; it consolidates when dried, and then resembles a resinous secretion, varying in colour from yellowish to dark red; some sacs are found nearly empty, in others the castor distends the sac, and when recently imported has a soft consistence, somewhat like thick turpentine. American castor is the only description at present recognised in commerce; Russian castor is described as having a different empyreumatic odour, and frequently effervescing with dilute acids from containing chalk; it is very expensive, and only considered interesting from its rarity. Good castor has a strong, peculiar smell, and bitter, nauseous, and slightly acrid taste; it affords about one or two per cent. of pale yellow volatile oil, a crystalline fatty substance termed castorine, dark brown resin, and several unimportant animal substances. Pereira observed that water distilled from castor gradually developed oil of spiræa, or hydruret of salycil, which he inferred was the produce of altered salicine, derived from the willow plants on which the beavers fed.

Effects.—Castor was formerly considered to possess antispasmodic properties, and was used for hysterical and nervous affections, and in the treatment of uterine diseases; it has gradually fallen into almost perfect disuse, though occasionally added to carminative mixtures for infants.

Dose.—If used in substance, the dose should be at least thirty to sixty grains, reduced to powder.

TINCTURA CASTOREI.—Tincture of Castor.—This is too weak to be of any positive service; it is sometimes used with the warm aromatic oils and antacids, as magnesia, to relieve flatulent colic in children.

Dose.—For the adult, fʒij. to fʒiv., or upwards; for children, gtt. v. to gtt. xxx., according to their age.

Preparation.—Castor, ℥j.; proof spirit, Oj. Macerate for seven days; strain, express, filter, and add sufficient rectified spirit to make Oj.

ADEPS PRÆPARATUS.—Prepared Lard.—Or Axungia, is obtained by melting the fat of the animal, and straining to remove the membranous parts; the fat is then usually poured into bladders for use; it is a well-known white and soft fatty substance, which is stated to melt about 100°; but, according to Pereira, its melting point varies from 78·5° to 87·5°; it consists of liquid fat, or olein, sixty-two per cent., and solid stearine, thirty-eight per cent., is perfectly soluble in ether, and should have no taste or smell; by exposure to the air it becomes rancid, acquiring a sour unpleasant odour, and acid reaction; when boiled with distilled water, the filtered and cooled liquid ought to afford no precipitate with solution of nitrate of silver, showing the absence of common salt, that is often added to lard to assist in its preservation, but which unfits it for medical purposes.

Uses.—Lard is employed in preparing some ointments; its properties are those of an emollient fatty substance.

FEL BOVINUM.—Ox Gall.—The gall collected from the recent gall bladder of the ox is employed for preparing purified ox gall; it is a ropy yellowish-green fluid, sp. gr. about 1·026, having a faint peculiar odour, and tasting intensely bitter; freely miscible with water or spirit of wine, and containing in solution two peculiar resinous acids, the glycocholic and taurocholic, both of which have nitrogen, and are united to soda, constituting a species of soap; besides this, there is some mucus derived from the coats of the gall bladder, a small portion of cholesterine, or biliary fat, that is a frequent component of gall stones, and a little oleic and stearic acids, combined with potash and ammonia, and the peculiar green colouring matter of the bile, considered by Berzelius to be related to chlorophylle. Glycocholic acid, $HO, C_{52}H_{42}NO_{11}$, is difficult to obtain in a state of purity; it crystallizes in white acicular needles, and constitutes the principal portion of the resinous matter of ox gall. Taurocholic acid, $HO, C_{52}H_{44}NO_{13}S_2$ has not been isolated in a pure state; it is least abundant in ox gall, though it is obtained in large quantity from the bile of fish. The union of these acids furnishes the essential or true biliary substance, the other constituents being considered rather accidental additions. Fresh ox gall has the property of rendering writing ink very liquid, and fullers use it for removing grease from cloth.

Fel Bovinum Purificatum.—Purified ox gall is a yellowish-green substance, of soft pilular consistence; tasting at first very sweet, but soon becoming intensely bitter; it dissolves in water or spirit; its watery solution gives no precipitate on the addition of rectified spirit, being perfectly free from mucus; and when a grain or two are dissolved and added to distilled water, f℥j., when treated first with a drop of freshly-made syrup, and then with strong sulphuric acid cautiously added until the precipitate first formed is redissolved, it exhibits a cherry-red colour, changing in succession to carmine, purple, and violet.

Preparation.—Take fresh ox gall, Oj.; rectified spirit, Oij. Mix by agitation in a bottle, and set aside for twelve hours until the sediment subsides; decant the clear solution, and evaporate in a porcelain capsule on a water bath until the residue acquires the consistence of a vegetable extract.

The spirit precipitates the mucus, which is removed, and the resulting extract is rendered much less liable to putrefaction.

Effects.—This substance is used to assist digestion in different dyspeptic states. Dr. Copland recommends it in mesenteric affections, and has found it exceedingly useful when the secretion of bile is defective in quantity, and the mucous membrane of the intestines irritable and relaxed. Dr. Clay, of Manchester, says that it is not purgative, but acts merely as a solvent of the material contained within the intestinal canal, and, by liquefying the mass, facilitates its excretion; used in enemas with this intention in obstinate cases of obstruction from lodgments in the lower bowels, I have known its administration attended with the best possible results. Dr. Neligan gave it in those instances where there was morbid irritability of the stomach, accompanied by vomiting soon after the meals, and not dependent on organic disease; he considered its action was gently laxative. It is occasionally prescribed as an adjunct to purgative pill masses, when the hepatic secretion is defective.

Dose.—Five to ten grains, three or four times in the day. For enemas, sixty grains, or upwards, are dissolved in f℥xij. of tepid water.

LAC.—Cow's Milk.—Milk enters into the preparation of mistura scammonii, having the property of perfectly suspending the resin, and disguising its taste. When recently drawn, milk reacts slightly alkaline, and under the microscope is seen to consist of innumerable minute oleaginous particles, floating in a serous fluid; its sp. gr. is about 1·30; but both its density and its components are liable to wide variations, independent of any adulterating addition. It has been repeatedly analyzed; in 100 parts of good milk there are, on an average, water, 87·4; butter, 4·0; sugar and soluble salts, 5·0; casein and insoluble salts, 3·6.

Adulterations.—The principal sophistications which are practised appear to be, the separation of the cream, and the addition of a quantity of water, with some salt or sugar, or a mixture of both, to restore the density of the liquid. Dr. H. Minchin, who has devoted special attention to this subject, informs me that he finds the ordinary method of testing by a lactometer is very fallacious, as the richer the milk, the less is its cream disposed to float; and when warm water is previously mixed with it, a much larger quantity of cream will become visible after resting. Nor can the hydrometer afford much better assistance, as it is easy to reduce the milk to any required density; and the more cream that is then separated, the heavier the residual liquid must become. His ingenious galactoscope is based on the relative translucency of different depths of milk, placed in a wedge-shaped vessel, having a glass cover, and an opaque back. This instrument shows in a remarkably evident manner the composition of the fluid; it matters not what means have been used for the deterioration of the specimen; and when the milk is too poor in quality, it should always be rejected. I owe to Dr. Minchin also the following simple and satisfactory process for analyzing milk,—a matter of primary importance in our large public institutions. The average amount of solid constituents that remains, after evaporating 100 parts of milk of fair quality, will weigh at least 13 per cent.; if it exceeds this to any material extent, some solid foreign substance has been added; and should the quantity fall much short of thirteen per cent., there is excess of water, abstraction of the cream, or both. Hence the following simple plan suffices: weigh the residue left after evaporating 100 grains of the milk in a small capsule, and every half grain deficient of the normal thirteen grains will indicate 3·84, or nearly four per cent. of extra water.

SACCHARUM LACTIS ($C_{24}H_{24}O_{24}$).—SUGAR OF MILK.—Or lactine, is usually imported from the Continent, in the form of cylindrical masses, about two inches in diameter, and several inches long, crystallized on sticks, or cords; it consists of numerous square prisms, which are greyish-white, without odour, having a faint sweetish taste, and feeling gritty in the mouth. Sugar of milk is sparingly soluble in cold water, which dissolves about one-sixth of its weight, and is insoluble in alcohol; when pure, it is incapable of being fermented, though milk itself will ferment; if boiled with the dilute mineral acids, it becomes slowly altered to fruit sugar.

PREPARATION.—Milk is coagulated with rennet, and the curd perfectly removed; the whey is concentrated by evaporation until it is sufficiently reduced in quantity to crystallize; pieces of wood or cord are then introduced into the fluid, on which the sugar of milk is gradually deposited.

USES.—Sugar of milk is principally employed for suspending active medical substances, or heavy powders, for which it is well adapted; thus, GERMAN DOVER'S POWDER is made by substituting it for sulphate of potash, adding opium and ipecacuanha, in similar proportions to the officinal formula. This sugar is never used for an article of diet, although it appears well adapted to form a substitute for cane sugar in the food of infants; and the suggestion has been made that it would not be liable to turn acid during digestion.

PEPSINA.—PEPSIN.—The gastric juice of some of the inferior animals has been used in treating dyspepsia; those chiefly employed are the sheep, calf, or pig, from which an infusion of the true stomach in water or wine, or the farinaceous preparation termed pepsin, is obtained. Pure gastric juice contains about ninety-seven per cent. of water, 1·75 of salts, a free acid, and 1·25 of a substance which has been considered by chemists a special organic principle, designated pepsin; it affords nitrogen, and in the presence of a weak acid has the power of dissolving the fibrinous and coagulated albuminous elements that are ordinary constituents of our food. According to Boudault, it can be isolated by washing the sheep or calf's stomach to remove any adherent food, then scraping off the inner mucous membrane with a knife, and bruising it in a mortar; it is next macerated in water for twelve hours, filtered, and the clear fluid precipitated by solution of acetate of lead, which throws down an insoluble peptate of lead; this substance, decomposed by a stream of sulphuretted hydrogen when suspended in water, to deposit the lead, leaves a neutral solution, containing liquid pepsin. To confer on it a decided acid reaction, so that it can promote digestion, some lactic acid is added until the fluid becomes as acid as the gastric secretion that exists normally in the stomach of a healthy dog; the resulting solution is evaporated to a syrupy consistence, and mixed with starch, and then dried thoroughly at a low temperature, so as to afford a preparation of such strength that gr. xv. will completely dissolve sixty grains of dried fibrin. A much simpler and equally effective process would be, macerating the clean fresh stomach in distilled water, acidulated with lactic acid, filtering, evaporating, and then adding starch. A temperature above 120° impairs or destroys the solvent properties of pepsin. The pepsin of M. Boudault, which is commonly used for medical purposes, is a pale fawn-coloured powder that coheres slightly, has a peculiar faint odour and taste, and reacts decidedly acid; it can be combined with simple bitters, chalybeates, opiates, hydrocyanic acid, or the ordinary remedies employed in the treatment of chronic gastric affections. Its activity is destroyed by the addition of tannin, or of strong alcohol.

Essence of Rennet.—Is largely used to coagulate warm milk, when added to it in the proportion of a teaspoonful to a pint of milk; the soft curd forms an excellent article of food for convalescent invalids; and the whey, if care is taken to prepare it without employing too much salt, is of great service as a bland and unirritating drink for young children suffering from gastric or infantile remittent fever. The essence of rennet has also been given in teaspoonful doses, with or immediately after meals, to promote digestion; and even recommended in diabetes to convert the grape sugar formed in the stomach into lactic acid, and thus prevent its entering the circulation; unfortunately, its beneficial results in this disease have not equalled the expectations which were entertained respecting it.

Preparation.—Essence of rennet is procured by infusing the recent stomach of a calf, well washed, cleansed, and cut into small pieces, in a strong solution of salt and water for about a week, and filtering off the clear fluid. A teaspoonful of this should coagulate at least a pint of new milk, warmed to about the temperature of blood heat.

Rennet Wine.—Is obtained by cleansing the stomach of a calf with water, cutting off the cardiac portion, which contains few or none of the gastric glands, and placing the rest, divided into small portions, in a bottle of good sherry for about one week, strengthening the sherry with a little brandy in proportion to the dilution it undergoes, then filtering the clear liquid for use.

Dose.—Boudault's pepsin is given in doses of gr. xv., taken with the meals, or immediately after them; it may be used in powder, mixed with soup, or eaten spread between two thin layers of bread and butter. Of the pepsin wine, the dose is a dessert spoonful or a tablespoonful, taken during a meal. When of good quality, Boudault's pepsin should dissolve at least four times its weight of dried fibrin.

SEVUM PRÆPARATUM.—Prepared Suet.—Is the fat of the sheep, *Ovis aries*, obtained from the region of the kidneys, purified by melting it over a slow fire, and strained through flannel, or linen, to separate the membranous portions; it is white, soft, and oleaginous, almost free from odour, and fuses at 103°. By pressure it can be separated into a solid portion, or stearin, and a liquid part, or olein, both of which, when saponified, afford glycerine, with stearic and oleic acids, respectively.

Stearic acid is a white crystalline substance, represented by the formula $C_{36}H_{36}O_4$. It melts at 159°, and is procured in colourless rhombic plates by evaporating an ethereal solution. Oleic acid is a clear limpid oil at ordinary temperatures, which rapidly absorbs oxygen, and becomes rancid; it is difficult to isolate in a pure state; it consists of $HO,C_{36}H_{33}O_3$.

Uses.—Suet is employed to confer consistence on ointments: like other fats, it is nutritious, and is sometimes boiled with new milk in small quantities, and given as a domestic remedy for chronic bowel complaints.

SUPPLEMENTARY LIST,

CONTAINING PREPARATIONS THAT ARE NOT OFFICINAL, OR DESCRIBED IN THE PRECEDING PORTIONS OF THIS WORK.

Amber, Oil of.—An empyreumatic mixture of several hydrocarbons, resembling oil of turpentine in composition and properties; it is sometimes used as a rubefacient, mixed with olive oil, in rheumatism, catarrhs, and hooping cough. **Roche's Embrocation** consists of oil of amber, f℥ss.; oil of cloves, fʒij.; olive oil, reddened with alkanet root, f℥jss. Mix.

Amylene, $C_{10}H_{10}$.—A colourless mobile liquid, having the odour of decaying cabbage, got by distilling fousel oil with a concentrated solution of chloride of zinc. It was introduced by Dr. Snow as an anæsthetic, and requires to be used in quantity intermediate between chloroform and ether to induce insensibility. In Dr. Snow's inhaler, about fʒj. evaporated every minute, and the result was obtained in about three minutes or less. Its odour has greatly interfered with its adoption, and it is also difficult to obtain in a state of purity.

Aniline, Sulphate of.—Was recommended some years since for curing chorea, given in doses of one-fourth to one-half a grain, three times in the day, gradually increased to gr. vij. The skin, lips, and nails of the patients acquired an indigo-blue colour, from the oxidation of the aniline, producing mauve; but it failed so repeatedly to accomplish the slightest beneficial results, that it has gradually fallen into disuse.

Apiol.—A yellowish, oily, acrid, and pungent fluid, procured from the seeds of common parsley, and smelling strongly of the plant. According to Homolle, apiol acts on the system like quinia, and cures intermittent fevers somewhat in the same manner, if given in doses of gtt. iij. to gtt. vj., thrice daily; and in larger quantities will cause all those symptoms that result from full doses of quinia, termed quinism. It is got by exhausting the seeds with strong alcohol, decolorizing with animal charcoal, evaporating the fluid to one-fourth, and then treating with chloroform or ether, which takes up the apiol; the oil can be further purified by mixing it with litharge, and again filtering though charcoal.

Areca Nuts.—The seeds of the Betel nut palm, *Areca catechu*, form the celebrated masticatory of the East; boiled in water, they afford an astringent extract, resembling ordinary catechu, which does not appear to be imported into Europe.

The tooth powder sold as Areca charcoal usually consists of ordinary wood charcoal, reduced to powder.

Arseniate of Ammonia.—Is obtained crystallized in white transparent rhomboidal prisms, by saturating a solution of arsenic acid with ammonia, and evaporating; if exposed to the air, it effloresces, and loses some ammonia. This salt has been used in the treatment of obstinate cutaneous eruptions, particularly for psoriasis, given in doses of one-twenty-fourth to one-tenth of a grain, thrice daily; or the following solution of "Bietts" can be prescribed:—Dissolve arseniate of ammonia, gr. j., in distilled water, f℥j. **Dose.**—Twenty minims to fʒss., taken with or after meals.

Arsenic, Iodide of (United States' Pharmacopœia).—Rub arsenic, 60 grains, to fine powder; add iodine, 300 grains; mix thoroughly; place in a small flask, and gently heat till liquefied, inclining the vessel so that any iodine that sublimes may be returned into the melted mass; then pour out on a porcelain slab, and when cool break, and preserve in bottles. It is an orange-red crystalline solid, perfectly soluble in water, which has been given in chronic cutaneous eruptions, and other affections for which arsenic proves of service, in doses of $\frac{1}{10}$th of a grain, thrice daily, cautiously increased to $\frac{1}{4}$th of a grain, made into pill.

Arsenic, Solution of the Chloride.—Or De Valangin's solution, consists of arsenious acid, gr. xxx.; hydrochloric acid, fʒjss.; water, Oj.

Dose.—Gtt. v. to gtt. xv., thrice daily. This is a mere solution of unchanged arsenious acid, no perfect chloride resulting; it has ceased to be officinal.

Asarum Europæum.—Asarabacca leaves, when powdered, are sometimes used to excite sneezing and mucous discharge in headach, chronic catarrh, and some cerebral affections. The plant is a native of Westmoreland, belonging to the order *Aristolochiaceæ*; its rootstock sends up two reniform leaves, between which rises a single drooping greenish-brown flower.

Barytes, Nitrate of.—Got by saturating carbonate of barytes with dilute nitric acid, and evaporating, to obtain crystals; it forms octohedral white crystals, soluble in twelve parts of cold water, which can be used in medicine, similar to the chloride of barium, in doses of one-tenth to one-eighth of a grain. It is much employed in testing for sulphates, with which it produces an insoluble white precipitate of sulphate of barytes, and is preferable to the chloride for this purpose, whenever the solution contains salts of lead or silver, or subsalts of mercury.

Bismuth, Subcarbonate of.—Obtained by precipitating solution of the nitrate of bismuth with carbonate of soda. It is a white tasteless powder, considered to possess the same properties as bismuthum album, and to have the advantage of more readily dissolving in the gastric acids, which it assists in neutralizing.

Dose.—Five to ten grains; it is distinguished from the subnitrate by effervescing freely when tested with dilute mineral acids.

Benzole.—Benzine, or Phene ($C_{12}H_6$).—Is a colourless limpid fluid, sp. gr. 0·86; having a peculiar and not unpleasant odour, resembling naphtha, which becomes solid at 32°, and is highly inflammable; it is an excellent solvent for caoutchouc, gutta percha, wax, camphor, oils, and other fatty bodies, and is much used for removing grease stains. This liquid was obtained by distilling benzoic acid with lime; it is now usually got in preparing coal naphtha, two gallons of which will yield about a pint of pure benzole. I have found it of service in treating cases of acne indurata, as a local application; and its powerful solvent properties render it of interest in many ways.

Bromide of Ammonium.—Has been recommended in the treatment of hooping cough, and other spasmodic affections of the respiratory organs. It does not appear to have any special influence over the catarrhal symptoms that frequently accompany the disease, but is alleged to have considerable effect in relieving the convulsive fits of hooping; it crystallizes in small rough masses, resembling common salt, of white colour, readily soluble in water, and having some pungency of taste. The dose ranges from two to ten grains, given three or four times in the day, according to the age of the child; and the rule has sometimes been proposed of using one grain for each year of the child's age. It is obtained by decomposing a solution of bromide of iron with solution of ammonia, filtering off the oxide of iron that precipitates, and evaporating the solution.

Bromide of Iron.—This is a brick-red deliquescent solid, with an acrid styptic taste, which readily oxidizes, if exposed to the air. It is prepared by adding to bromine, covered by a stratum of water, some iron filings, and gently heating until the fluid becomes greenish-coloured, then filtering, and evaporating to dryness in a bright iron vessel. The medical properties of this salt appear to resemble those of the iodide of iron; it is given in scrofulous affections, and is said to have been found useful in treating hypertrophy of the uterus. The best preparation for its administration is the syrup of bromide of iron, got by dissolving bromine, 200 grains; iron filings, 84 grains; in water, 2000 grains, filtering, and adding refined sugar, 1400 grains. This syrup should be preserved in small bottles, tied with bladder. The dose is twenty minims, thrice daily, gradually increased.

Cacao Butter.—Got from the chocolate nut by pressure. It is an oil, of the consistence of tallow, having an agreeable odour, which readily liquefies when gently warmed; it is much used to make suppositories, and strongly recommended as the basis of ointments, particularly for ophthalmic surgery, as it is free from irritating properties, and does not become rancid.

Calcium, Sulphuret of.—The yellow solution, obtained by boiling sulphur, ℥jss.; quick lime, ʒss.; in water, Oj., for ten minutes, constantly stirring, and straining off the clear fluid for use; is an excellent remedy for treating all cases of scabies; it consists of a mixture of pentasulphide of calcium and hyposulphite of lime, $2\ CaS_5 + CaO,\ S_2O_2$. In applying it a warm bath is first employed, and then the fluid must be well rubbed into all the affected parts with a sponge; as it evaporates, a yellow sulphurous layer deposits, which is perfectly removed by a second bath. A single application proves sufficient for most attacks.

Carbazotic Acid ($C_{12}H_3N_3O_{14}$).—Or Picric acid, is obtained by acting on various organic substances, as carbolic acid, silk, indigo, salicin, and several resins, with nitric acid. It crystallizes in long brilliant yellow plates, freely soluble in alcohol or ether, and requiring about eighty parts of cold water for solution, forming a bright yellow fluid, of intense bitter taste; its salts are also yellow, and bitter, and when heated decompose, with explosion. In large doses it appears to be poisonous; given in medical doses of gr. ss. to gr. ij., thrice daily, it is considered to possess tonic and anti-periodic properties, resembling quinine; it has been used in agues, intermitting neuralgias, and the ordinary class of cases where tonics are indicated, with considerable success. When this acid or its salts are given for some time, the skin and conjunctiva acquire a deep yellow hue, and the urine becomes orange-coloured. This effect, according to Dr. Calvert, generally ensues after two to fifteen days, or when about gr. xv. of the acid have been taken; it may continue perceptible for two or three weeks. The presence of the acid is detected in the urine by adding acetate of lead, and then acetic acid, filtering off the clear solution, evaporating it to dryness, and forming an ethereal extract; this is again evaporated, and the residue dissolved in water. Boiled white silk immersed in the liquid acquires a yellow hue, in proportion to the amount of carbazotic acid present.

Carbaozotate of Iron.—Is got by digesting crystals of carbazotic acid with recently precipitated sesquioxide of iron in water, to saturation; the filtered solution is evaporated at 212°, and affords a reddish-brown amorphous mass, which tastes astringent, and intensely bitter; it is best given in pill, in doses of gr. ss. to gr. jss., and is particularly recommended in cases of obstinate cephalalgia.

Cerium, Oxalate of.—A white powder, of faint pink tinge, tasteless, without odour, and insoluble in water; it has been recommended in doses of gr. iij. to gr. v., taken three or four times in the day, to relieve the vomiting of pregnancy, particularly in its earlier stages; and for other forms of chronic emesis not dependent on organic changes in the stomach, such as the nausea and vomiting that accompany tubercular affections of the lungs, and also in some cases of epilepsy attended with gastric disturbance. I have found it of the greatest benefit in suitable cases, and prefer using it in powder, combined with bismuth and antacids. The NITRATE OF CERIUM is occasionally employed in the same class of affections.

Chlorodyne.—This anodyne preparation, introduced by Dr. Browne, has been so much used, that several imitations are in demand; it is sold in blue bottles, each holding about fʒj., and certainly acts as an effectual anodyne, in the same doses in which tincture of opium is prescribed, but appears to possess no superiority, and its secret character is objectionable. Mr. Ogden's formula consists of chloroform, fʒvj.; chloric ether (a mixture of chloroform, one part; rectified spirit, seven parts, f℥j.); tincture of capsicum, fʒss.; oil of peppermint, gtt. ij.; muriate of morphia, gr. viij.; perchloric acid, gtt. xij.; tincture of Indian hemp, fʒj.; treacle, f℥j.

According to other authorities, the original chlorodyne contains a small portion of hydrocyanic acid.

Dose.—Fifteen to thirty drops.

Cimifuga, or Actæa Racemosa.—The cohosh, or black snake root, of America, is a plant about six feet high, with leaves resembling monk's-hood; the flowers are small, white, in a long raceme; the fruit an ovate capsule; it belongs to the Natural Order, *Ranunculaceæ*. The root is used; it is rough, twisted, and dark black outside, whitish within, having numerous slender radicles; it smells unpleasant, and tastes bitter, and rather acrid; this affords four and three quarters-per cent. of a dark brown impure resin, termed cimifugin, which is much used in America for treating chorea and uterine affections. The TINCTURE was introduced as a remedy for rheumatism, sciatica, and some forms of puerperal hypochondriasis; it is prepared by macerating ℥iv. of the root in rectified spirit, Oj.; and given in doses of fʒj. to fʒij., three or four times in the day. I have found it of service, in some cases of sciatica and lumbago, and other chronic rheumatic affections.

Cod Liver Oil with Quinia.—Is obtained by precipitating solution of sulphate of quinia with water of ammonia, and dissolving the washed and pure quinia in oleic acid; adding gr. ij. of quinia, converted into an oleate, to each f℥j. of cod liver oil: this affords a permanently clear solution, which is employed in the same manner as cod liver oil.

Cold Cream.—Is prepared by melting white wax, ℥j. with almond oil, f℥iv.; to this add rose water, f℥ij.; borax, gr. xxx., previously dissolved and warmed; stir constantly until cool; add otto of roses, gtt. x. This agreeable cerate is applied to chapped and tender surfaces, and to the face after exposure to excessive solar heat; and for dressing superficial discharging sores. CUCUMBER CREAM is obtained in a similar manner, substituting the juice of cucumbers for rose water, after gently heating it, to coagulate the albuminous and colouring matters which are rejected.

Cotyledon Umbilicus.—This indigenous plant, which grows commonly on rocks and the walls of old ruins, belongs to the *Crassulaceæ*, and has peltate leaves; its flowers are pale yellowish, forming a raceme about six inches high. The expressed juice, in doses of f℥j., or the inspissated fluid extract, in doses of fʒj., twice daily, are sometimes used in treating epilepsy.

Cyanide of Potassium (KCy).—Is prepared on the large scale by incinerating yellow prussiate of potash, and dissolving out the resulting salt; thus obtained it is extensively used for photographic purposes, though too impure to be employed in medicine. A pure product can be got by mixing the ferrocyanide of potassium with one-eighth its weight of charcoal before incinerating, and crystallizing the cyanide of potassium from boiling alcohol; it is highly poisonous, and when moist gives off an odour of hydrocyanic acid; exposed to the air, it rapidly attracts moisture and deliquesces. This salt is a useful agent for removing stains of nitrate of silver from linen or the skin; it has also been given internally, but requires extreme caution, as it is equivalent to two-fifths its weight of pure hydrocyanic acid. Accidents are not infrequent from the careless employment of this dangerous substance; they require similar treatment to that recommended in poisoning with prussic acid.

Datura Tatula.—Is distinguished from the ordinary stramonium plant by having a dark reddish stem, dotted with green, and purple-coloured flowers, striped with deep purple on the inside. It has been recommended as a remedy in attacks of spasmodic asthma, used in the same manner as stramonium, over which it appears to have no special advantages.

Donovan's Solution.—Liquor hydrargyri et arsenici hydriodatis, is no longer officinal, though sometimes employed in those affections for which the alterative action of arsenic is of service; the simplified formula of the United States' Pharmacopœia is given:—Take iodide of arsenic, and red iodide of mercury, of each, gr. xxxv.; distilled water, f℥ss.; rub until dissolved, and add more water, to make Oss. Filter.

Dose.—Five to ten drops, thrice daily, using the same precautions as when administering Fowler's solution.

Euphorbium.—Is imported from Mogadore. It is stated to be procured on the lower Atlas range, from different species of euphorbium; it forms dull yellow friable masses, usually pierced with one or two holes by the prickles of the plant, with little odour, and having a burning, disagreeable taste; its powder powerfully irritates the eyes and nose, and exposure to it whilst grinding the drug has produced delirium and convulsions. It is sometimes used in preparing vesicating applications, particularly horse blisters.

Fucus Vesiculosus.—An extract obtained by acting on the pounded pulp of this seaweed with spirit, and evaporating the resulting tincture, has been advised in the treatment of excessive obesity; it readily attracts moisture, and is usually given in the form of pill; as it possesses trifling activity, the dose may be liberal: from gr. v. to gr. x., can be given with or after meals; it is supposed to increase the quantity of the urinary secretion, and alter its composition; it requires to be persevered in for a long time, at least two or three months.

Gold, Chloride of, with Sodium (French Codex).—Is given internally, in the same cases as chloride of mercury, as a powerful alterative remedy, in doses of $\frac{1}{20}$th to $\frac{1}{10}$th of a grain, made into pills, with some inert powder, or applied by friction to the gums and tongue; it has also been used in ointment, for dressing phagedenic and lupoid ulcerations. It is got by dissolving terchloride of gold, eighty-five parts; chloride of sodium, sixteen parts, in a little distilled water, and crystallizing; it forms yellow quadrangular prisms, slightly deliquescent, and soluble in four parts of water.

Harrowgate Water, Artificial.—Is prepared by dissolving chloride of sodium, ℥j.; sulphate of magnesia, ℥jss.; sulphuret of potash, 30 grains; in boiling water, f℥xviij. Dose.—A wine glassful, taken in a cup of warm water.

Hypophosphorous Acid, and the Hypophosphites.—These salts have been introduced as remedies for diseases of debility, and even proposed as affording a kind of panacea in consumption. Some practitioners consider them of service in nervous affections, and for convulsive diseases, as chorea and epilepsy; they are advocated because it is supposed that the loose state of combination in which the phosphorus is present will enable it to become sooner assimilated, and assist in the formation of new and healthy tissue. A series of disinterested observations are still required, to determine what are their positive claims in pharmacy.

Hypophosphite of Soda.—Crystallizes in deliquescent nacreous rectangular plates: when pure, it readily dissolves in spirit of wine, or water; it consists of $NaO, 2\,HO, PO$. It is got by decomposing hypophosphite of lime, ℥vj., with crystals of carbonate of soda, ℥x., each dissolved in water, separating the carbonate of lime, and crystallizing the solution; to procure crystals, it is re-dissolved in spirit, and again evaporated. It occasionally explodes during the evaporation of its aqueous solution..

Hypophosphite of Potash.—Is obtained like the soda salt, using granulated carbonate of potash, 5¾ ounces, instead of soda, and much less water to dissolve it. This is a white, opaque, deliquescent semi-crystalline powder, which rapidly attracts moisture.

Hypophosphite of Lime.—Crystallizes in white pearly flattened prisms, soluble in six parts of cold water, and not deliquescent; it consists of $CaO, 2\,HO, PO$, and possesses a bitter taste, it can be got by boiling phosphorus with milk of lime in water—a dangerous process, as much phosphuretted hydrogen escapes in an inflammable condition; when this ceases, and the phosphorus is all oxidized, the fluid is filtered, evaporated, and crystallized.

Hypophosphite of Iron.—Is a white, tasteless, amorphous powder, consisting of $Fe_2O_3\ 3\,PO$. It is got by decomposing sulphate of iron, 600 grains (previously converted into a persulphate) with hyposulphite of soda, 534 grains, dissolved in water, Oj.; the resulting gelatinous precipitate is collected on a filter, washed, and dried at 212°; it should be completely soluble without effervescence in hydrochloric acid.

The average dose of any of these salts is from three to ten grains, taken twice or thrice daily.

Iodated Sulphur.—Got by melting iodine with one-fourth its weight of sulphur in a flask, is considered to be a mere mixture of its constituents, which are easily separated from each other; it has been chiefly used in ointment for treating chronic eruptions, particularly psoriasis and indurated acne; its action is that of a tolerably powerful local irritant, and it ought to be used sufficiently diluted. Ten to twenty grains suffice for lard, ℥j.

Iodide of Ammonium.—Got by adding excess of ammonia to hydriodic acid, and evaporating; it forms deliquescent cubic crystals, and has been used instead of iodide of potassium; its effects are considered more irritating than that salt: the dose varies from two to eight or ten grains, given thrice daily, in solution.

Iodide of Sodium.—Is occasionally preferred for internal use to the iodide of potassium, and stated to agree better when the stomach is in an irritable condition, but is objectionable from readily deliquescing. It is got by decomposing iodide of iron in solution with carbonate of soda, filtering, and evaporating the clear fluid; if crystallized above 120°, it forms white anhydrous cubes, containing no water; at lower temperatures it produces flat hexagonal prisms with 4 HO. **Dose.**—Similar to the iodide of potassium.

Iron, Granulated Effervescing Carbonate of.—Consists of small granular particles, which have a slight greenish tint; when dissolved in water, it forms a pleasant effervescing draught, of mild chalybeate taste; it should be kept in bottles in a dry place; its properties are those of a simple ferruginous tonic. Ninety grains, the usual dose, are equivalent to gr. iv. of carbonate of iron; this is taken twice or thrice daily, in half a tumblerful of cold water. The following is the formula of Dr. Skinner, of Liverpool:—Tartaric acid, ℥iij.; bicarbonate of soda, ℥v.; sulphate of iron, ℥j.; dry at a temperature not exceeding 200°; mix the sulphate with powdered sugar, 1¾ ounce, and half the tartaric acid; rub citric acid, one quarter of an ounce, to fine powder, and mix with the rest of the tartaric acid and bicarbonate of soda; combine both mixtures by trituration, and pass through a fine sieve. The resulting powder is then heated in a metallic pan set in a water bath until it begins to granulate, when it is rapidly stirred until the whole mass has become divided into globules.

Larch Bark.—A tincture of the bark of *Larix Europea* is prepared by macerating ℥ij. in proof spirit, Oj., and given in doses of fʒj. to fʒiij. A watery extract is also made, which is advised in doses of gr. v. to gr. xx., in pills or solution. It has been recommended as an astringent and mild stimulant in excessive discharges from the mucous membranes, in chronic catarrhs, after hæmoptysis, for leucorrhœa, and especially in subacute cystitis. Though advised to check hæmorrhages from different internal surfaces, we possess other more active and reliable agents; nor can it be relied on for purpura hæmorrhagica, or severe attacks of menorrhagia.

Lemon and Kali, or Citrated Kali.—For preparing effervescing draughts, is composed of dried white sugar, lb. ij.; citric acid, ℥xiv.; bicarbonate of potash, ℥xvj.; dry and powder each separately; then mix, and add oil of lemon, fʒj. This keeps better if bicarbonate of soda is substituted for the potash; it must be preserved in closed bottles.

Leptandrin.—An impure resinoid, obtained from the root of *Leptandra Virginica*, by adding a strong alcoholic tincture to water at a temperature not exceeding 180°; it is a jet-black or brownish-coloured substance, soluble in rectified spirit or alkaline fluids, and considered to operate as an efficient cholagogue without causing much purging; it is frequently used in ordinary purgative pill masses in America, in doses of gr. ij. to gr. iv., though as yet little employed in these lands.

Lotio Nigra.—Black wash is largely used for dressing syphilitic and other irritable ulcerations, the precipitate being applied on a little lint to the affected surface; the upper portion of the lotion is worthless. It is obtained by adding calomel, gr. iv., to lime water, f℥j.; the reaction affording a deposit of suboxide of mercury and chloride of calcium in solution, $Hg_2Cl + CaO = CaCl + Hg_2O$. If used to extensive sores, the mercury is liable to cause salivation, by becoming absorbed. **Yellow wash** is got by adding corrosive sublimate, gr. ij., to lime water, f℥j.: the precipitate consists of hydrated oxide of mercury; an excess of the corrosive sublimate will form a brown oxychloride of mercury.

Lycopodium Clavatum.—The spores of this club-moss are gathered in Germany, and much used for involving pill masses; it forms a fine light pale yellow powder, free from taste or smell; it can also be used as an absorbent application, to dry up excoriated surfaces.

Magnesia, Granular Citrate of (Mr. H. Draper).—The effervescing salt which is sold under this name is employed as a cooling saline aperient, in doses of a teaspoonful, or upwards, taken in half a tumblerful of water; it is prepared by rubbing up citric acid, 300 grains, with sulphate of magnesia, ʒij. 180 grains; add to the powder tartaric acid, ʒx.; bicarbonate of soda, ʒxij.; and mix intimately: pass through a sieve, and then place in a heated copper pan over a water bath, and stir constantly with a glass or bone spatula until it becomes granulated; finally, add oil of lemons, ten drops, and separate the coarser granules by a sieve for use.

Manganese, Sulphate of.—Forms pale rose-coloured crystals, which contain four to seven equivalents of water, according to the temperature they are obtained at; it is got by dissolving black oxide of manganese in sulphuric acid, evaporating, and gently igniting to decompose any sulphate of iron, dissolving in water, and again evaporating the solution until it crystallizes. It has a styptic bitterish taste; and is considered to exert a special influence on the liver, causing the secretion of orange-coloured bile in large quantity; and is particularly recommended in those cases where mercury is inadvisable from debility or other causes. The dose is gr. v., once, twice, or thrice daily with some sulphate of magnesia and dilute sulphuric acid, persevered in until the biliary discharges are noticed: large doses are stated to irritate the bowels, though so much as 60 to 120 grains have been given for a purgative. This salt is present in the mineral waters of Cransac, and forms their leading constituent.

Monesia.—A purified astringent extract, closely resembling kino in taste and properties, but dull-coloured and opaque; got from the *Chrysophyllum glyciphlæum*, a Brazilian tree, order *Sapotaceæ*; it possesses no advantages over other astringent substances, as catechu and rhatany. Dose.—gr. v. to gr. xv.

Morphia, Acetate of.—Got by saturating morphia with acetic acid, and crystallizing; its uses and doses are similar to the hydrochlorate; but when exposed to the air it parts with some acetic acid, and becomes incompletely soluble in water, unless additional acetic acid is added.

Morphia, Sulphate of.—Forms very soluble and bitter white feathery crystals, and is an excellent salt for medical use; its dose is the same as the hydrochlorate. It is got by saturating dilute sulphuric acid with morphia, and crystallizing.

Mucuna Pruriens.—Cowage is the stinging hairs which cover the pods of this leguminous plant; when magnified, they are observed to be finely pointed, and serrated at their apex. Applied to the skin, they excite intense irritation and itching, and have been given in electuary with treacle as a remedy for worms, particularly the round worm; their action is supposed to be mechanical. DOSE.—Ten to thirty grains, administered every morning; and followed, if necessary, after a few days by a brisk purgative.

NAPHTHALIN ($C_{20}H_8$).—Forms flaky cystals, consisting of pearly rhombic plates, having a powerful unpleasant odour, and acrid bitter taste; it gradually evaporates if exposed to the air, and dissolves in alcohol, ether, or oils; it is produced in making coal gas, and has recently filled up several of the Dublin gas pipes, causing much inconvenience. Given in doses of gr. iv. to gr. xx., in emulsion or syrup, it is considered to be a powerful stimulating expectorant, useful in humoral asthma, and in the latter stages of suffocative catarrh, in which it may be repeated every quarter of an hour until copious expectoration takes place; it has also been used in tubercular disease of the lungs in smaller quantities, as gr. j. to gr. iv., three or four times daily; and is alleged to act as a vermifuge. Externally it is employed in ointment, composed of gr. xvj. to ℥ss. of lard, for lepra and other scaly eruptions.

NICKEL, SULPHATE OF.—Got by dissolving oxide or carbonate of nickel in dilute sulphuric acid, and evaporating; it forms emerald-green efflorescent prismatic crystals, soluble in three parts of cold water, having a sweet astringent taste. Professor Simpson has given it with advantage as a tonic in obstinate periodic headach; the dose is gr. ss. to gr. j., thrice in the day, made into pill, or in solution.

ORPIMENT (AsS_3).—Yellow sulphuret of arsenic is obtained native, and also got by subliming sulphur and arsenious acid, when it often contains a large quantity of unchanged white arsenic. It is a dangerous poison, not used medically; it enters into the preparation of some depilatories, and is occasionally formed within the decaying bodies of persons poisoned by arsenic, from the development of sulphuretted hydrogen during putrefaction.

PEROXIDE OF HYDROGEN.—Dr. W. B. Richardson, of London, has recommended this fluid in the treatment of different forms of strumous disease, and for cases in which there is imperfect or difficult respiration; thus it is considered to be of service in mesenteric affections, and is said to cause glandular swellings to disappear, similar to the preparation of iodine; it also assists the stomach to retain cod liver oil; the dyspnœa of phthisis and of bronchitis was relieved by its use, and some cases of hooping-cough reported to have been benefited by it. Several methods are proposed for its preparation; one of these is to pass a constant stream of carbonic acid through water, and add from time to time some finely powdered binoxide of barium, BaO_2, which dissolves in the solution, and is then converted into insoluble carbonate of barytes, BaO, CO_2, giving off its second atom of oxygen, which combines with some of the water, and forms peroxide of hydrogen; the process is continued until a solution is obtained of sufficient strength. It is a colourless fluid, of acrid taste, with an odour resembling chlorine, but much diluted; very instable, decomposing at a temperature of 70°, and when more strongly heated, with almost explosive violence; it bleaches solution of litmus; if a drop of it is placed on the tongue, it destroys sensation for a time, and must therefore be largely diluted for medical use; it requires to be kept in a cool place. The dose is from fʒss. to f℥ss., diluted with so much water as will render it pleasant to the taste.

Peroxide of barium is got by heating caustic barytes to dull redness, and passing over it a current of oxygen gas, with which it gradually combines, forming the peroxide.

Quillai, or Soap Bark.—Is imported from South America, where it is much used on the Pacific coast as a detergent for domestic purposes, particularly for washing flannel and woollen articles, and is recently becoming introduced on the Continent to cleanse the hair and remove scurf. It appears well adapted for treating some of the eruptive diseases of the scalp where a mild stimulant is not objectionable; it abounds in saponin (?), and forms a thick lather with water; its powder will cause severe sneezing and irritation of the nares. This bark is obtained from *Quillaia saponaria.*

Recamier's Caustic.—Consists of chloride of gold, gr. vi., dissolved in strong nitric acid, fʒiij.; strong hydrochloric acid, fʒvj. It is applied on portions of lint to cancerous and lupoid ulcerations, and other cases requiring an extremely energetic corrosive agent.

Rhubarb, Syrup of.—A mild purgative, used in the diseases of infancy and childhood; given in doses of fʒj. to fʒiv., according to the age of the patient. It is prepared by infusing sliced rhubarb, ℥j., in boiling water, Oss., for two hours, straining, and forming the infusion into a pint of syrup.

Salicin ($C_{20}H_{18}O_{14}$).—A neutral bitter principle, obtained from the willow, forming colourless silky needles, soluble in cold water and alcohol; with sulphuric acid, it becomes deep red; by oxidation, it is changed to oil of meadow sweet, and a similar alteration occurs when it is excreted by the kidneys, after being used internally. It is occasionally given instead of quinine: its dose, as a tonic, varies from gr. ij. to gr. v.; and for a febrifuge, gr. xx. to gr. xl. are employed, in divided quantities, during the apyrexial stage of ague.

Saracenia Purpurea.—A decoction of the rhizome of this plant, which is a native of Northern America, was proposed as a remedy for small-pox. As it has completely failed when tried here, it is unnecessary to describe it.

Soda, Sulphate of ($NaO, SO_3 + 10HO$).—Glauber's salt forms long transparent colourless crystals, of bitter saline taste, which effloresce if exposed to the air. It operates as an active saline purgative, resembling sulphate of magnesia in its properties; but, in consequence of its bitter unpleasant taste, is gradually becoming disused. **Dose.**—A quarter of an ounce to an ounce, given in solution.

Sumbul.—Or Musk root, is probably derived from an umbelliferous plant, a native of Central Asia, whence it is imported through Russia. It is a thick root, occurring in soft circular pieces, two or three inches across; externally light brown, with a smooth epiderm; fibrous inside, of greyish-yellow colour, with a strong odour of musk, and a powerful aroma when chewed, resembling angelica. Reinsch found that it yielded traces of volatile oil, aromatic resin, wax, and a bitter principle. It was introduced into practice as a remedy for cholera, in which it failed completely, and afterwards given in affections of the nervous system, as chorea and hysteria; it has been extensively tried in epilepsy, and, like most new remedies, proved useful for a time in mitigating the attacks, and in some instances effecting a cure. Its dose, in powder, is five to twenty grains. The infusion is made with the bruised root, ℥ss.; boiling water, Oss.; infuse for an hour. f℥ss. to f℥j. of this is given every two or three hours. A tincture is prepared by macerating ℥ij. of the root in proof spirit, Oj. Dose.—fʒj. or fʒij.

Triticum Repens.—Or couch grass, has been occasionally used in cases of irritability of the bladder, and painful micturition, connected with diseases of the bladder or prostate; it is given in infusion or decoction, prepared from the dried and cut rhizome, ℥ss., with boiling water, Oj.; infused for an hour, or boiled for fifteen minutes; the dose varies from Oss. to Oj., during the day. The herb should be collected early in spring.

Urea ($C_2H_4N_2O_2$).—Is obtained artificially by dissolving cyanate of ammonia in boiling alcohol; the solution affords crystals of urea as it cools; it can also be got by evaporating urine to the consistence of syrup, adding to this pure nitric acid at a low temperature, and collecting the crystals of nitrate of urea which result; these are diffused in water, to which some carbonate of baryta is added, and the urea set free is separated from nitrate of baryta by boiling alcohol, and deposits in long striated colourless crystals as the solution cools. It melts at 248°, and decomposes at higher temperatures; its solution in water has a cool bitterish taste; when pure it keeps for a long time, but in the presence of mucus soon decays, affording carbonate of ammonia. In doses of five to ten grains, given every four hours, it is recommended as a powerful and certain diuretic; its action is assisted by the administration of diluents, and it is best prescribed dissolved in mixture.

Valerianate of Ammonia.—Can be got crystallized in pearly quadrangular plates, having a sweetish taste, and smelling of valerianic acid, by saturating water of ammonia with valerianic acid, evaporating below 150° to a syrupy consistence, and adding two volumes of alcohol; the resulting solution is then allowed to evaporate spontaneously. If exposed to the air, the salt rapidly deliquesces, and is therefore generally kept in a concentrated liquid form. It has been given in hysterical affections, epileptic attacks, and other nervous disorders, in doses of one to six grains, and has been particularly recommended for the treatment of neuralgic pains.

WEIGHTS AND MEASURES

OF THE

BRITISH PHARMACOPŒIA.

◆

WEIGHTS.

1 pound, . . .	lb. j.	= 16 ounces	= 7000 grains.
1 ounce, . . .	℥j.	=	437·5 grains.
1 grain, . . .	gr. j.		

MEASURES.

1 gallon, ...	Cj.	= 8 pints.
1 pint, ...	Oj.	= 20 fluid ounces.
1 fluid ounce, ...	f℥j.	= 8 fluid drachms.
1 fluid drachm, ...	fʒj.	= 60 minims.
1 minim, ...	♏j.	

RELATION OF MEASURES TO WEIGHTS OF THE BRITISH PHARMACOPŒIA.

1 gallon, ...	= the measure of	10	pounds	of water.
1 pint, ...	= „	1·25	„	„
1 fluid ounce, ...	= „	1	ounce	„
1 fluid drachm, ...	= „	54·68	grains	„
1 minim, ...	= „	0·91	„	„

To ascertain the weight of any liquid in imperial ounces or drachms, multiply its volume by its specific gravity.

To ascertain the volume, divide the weight by the specific gravity.

A wine glassful is about f℥ij.; a table spoonful, f℥ss.; a dessert spoonful, fʒij.; and a teaspoonful, fʒj.

BRITISH PHARMACOPŒIAL WEIGHTS, WITH THEIR FRENCH METRICAL EQUIVALENTS.

1 pound, ...	= 453·5925	grammes.
1 ounce, ...	= 28·3495	„
1 grain, ...	= ·0648	„

(1 gramme = 15·434 grains.)

BRITISH PHARMACOPŒIAL MEASURES, WITH THEIR FRENCH METRICAL EQUIVALENTS.

1 gallon, ...	= 4·543487	litres.
1 pint, ...	= ·567936	„
1 fluid ounce, . .	= ·028396	„
1 fluid drachm, .	= ·003549	„
1 minim, . . .	= ·000059	„

(1 millitre = 17 minims; 1 decilitre = 3½ ounces avoirdupois; 1 litre = 35¼ ounces avoirdupois.

WEIGHTS AND MEASURES OF THE AMERICAN PHARMACOPŒIA.

The Pound	Contains Troy weight	Twelve ounces.
Ounce		Eight drachms.
Drachm		Three scruples.
Scruple		Twenty grains.
The Gallon	Contains wine measure	Eight Pints.
Pint		Sixteen fluid ounces.
Fluid ounce		Eight fluid drachms.
Fluid drachm		Sixty minims.

POSOLOGICAL TABLE.

The quantities given in the following Table are those doses that can usually be administered to adults; for the aged and feeble some diminution ought commonly to be made; and in early childhood, a smaller amount of any medicine will be required, in proportion to the period of life. Thus at fourteen years of age, the ordinary dose will be about one-half; at seven years of age, one-third; and at four years of age, one-fourth, of the average quantity. All young children, however, bear purgatives proportionally better than adults, and are less tolerant of the action of narcotics or mercurials.

Acetum	f℥j. to f℥ij., or upwards.
Acidum Aceticum dilutum	,,
Arseniosum	gr. $\frac{1}{30}$th to gr. $\frac{1}{10}$th.
Benzoicum	gr. x. to gr. xx.
Citricum	gr. x. to gr. xxx.
Gallicum	gr. iij. to gr. xx.
Hydrochloricum dilutum	gtt. x. to gtt. xxx., considerably diluted.
Hydrocyanicum dilutum	gtt. ij. to gtt. iv.
Nitricum dilutum	gtt. x. to gtt. xxx., considerably diluted.
Nitro-Hydrochloricum dilutum	,,
Phosphoricum dilutum	,,
Sulphuricum dilutum	,,
,, aromaticum	,,
Tannicum	gr. iij. to gr. x.
Tartaricum	gr. x. to gr. xxx.
Aconitum (leaves)	gr. j. to gr. v.
Æther	gtt. xv. to f℥j.
Aloe	gr. v. to gr. xv.
Alumen	gr. x. to gr. lx.
Ammoniacum	gr. x. to gr. xxx.
Ammoniæ Benzoas	gr. x. to gr. xl.
Bicarbonas	gr. v. to gr. xx.
Carbonas (antacid and stimulant)	gr. iij. to gr. v.
,, (emetic)	gr. xx. to gr. xxx.
Hydrochloras	gr. v. to gr. x.
Liquor (dilute)	gtt. v. to gtt. xx., much diluted.

Ammoniæ Phosphas	gr. x. to gr. xl.
Antimonii Sulphuratum	gr. j. to iv.
Tartaratum (diaphoretic)	gr. $\frac{1}{16}$th to gr. $\frac{1}{6}$th.
(expectorant)	„
(nauseating)	gr. $\frac{1}{6}$th to gr. $\frac{1}{3}$.
(emetic)	gr. j. to gr. ij.
Aqua Anethi	*Ad libitum.*
Camphoræ	„
Carui	„
Cinnamomi	„
Floris Aurantii	„
Lauro Cerasi	fʒss. to fʒj.
Menthæ Piperitæ	*Ad libitum.*
„ Viridis	„
Pimentæ	„
Rosæ	„
Sambuci	„
Argenti Nitras	gr. ss. to gr. ij.
Oxidum	„
Assafœtida	gr. v. to gr. xxx.
Balsamum Canadense	gtt. xv. to gtt. xxx.
Peruvianum	„
Tolutanum	„
Beberiæ Sulphas	gr. ij. to gr. x.
Belladonnæ Folia	gr. ss. to gr. ij.
Bismuthum Album	gr. v. to gr. xx.
Bismuthi Carbonas	„
Borax	gr. x. to gr. lx.
Calcii Chloridum	gr. x., and upwards.
Calomelas (alterative)	gr. ss. to gr. j.
(antiphlogistic)	gr. j. to gr. v.
(cathartic)	gr. ij. to gr. vj.
Cambogia	gr. ij. to gr. v.
Camphora	gr. iij. to gr. x.
Cantharis	gr. ss. to gr. j.
Capsicum	gr. ss. to gr. v.
Carbo Animalis purificatus	gr. xx. to gr. lx.
Catechu	gr. v. to gr. lx.
Cerii Oxalas	gr. ij. to gr. vj.
Chloroformum	gtt. v. to gtt. xxx.
Cinchona (powder)	gr. v. to gr. lx., or upwards.
Cinchonia and its Salts	gr. j. to gr. x.
Cinnamomum	gr. x. to gr. xxx.
Colchicum (corm)	gr. ij. to gr. viij.
(seed)	gr. j. to gr. v.
Colocynthis	gr. ij. to gr. viij.
Confectio Piperis	gr. lx.
Rosæ Caninæ	*Ad libitum.*
Rosæ Gallicæ	„
Scammonii	gr. xv. to gr. xxx.

Confectio Sennæ	gr. lx., and upwards.
Sulphuris	,,
Terebinthinæ	,,
Conium (powder)	gr. ij. to gr. viij.
Copaiba	gtt. x. to fʒj.
Creasotum	gtt. j. to gtt iij.
Creta præparata	gr. x. to gr. lx.
præcipitata	,,
Cubeba (powder)	gr. xx. to gr. lx.
Cupri Sulphas (astringent)	gr. ss. to gr. ij.
(emetic)	gr. xv. to gr. xx.
Cusso	$\frac{1}{4}$th to $\frac{1}{2}$ an ounce.
Decoctum Aloes compositum	f℥ss. to f℥ij.
Cetrariæ	*Ad libitum.*
Cinchonæ flavæ	f℥ss. to f℥ij.
Granati radicis	f℥ij., or upwards.
Hæmatoxyli	f℥ss. to f℥ij.
Hordei	*Ad libitum.*
Pareiræ	f℥j. to f℥ij.
Quercus	,,
Sarsæ	f℥ij. to f℥viij.
Sarsæ compositum	,,
Scoparii	f℥ss. to f℥ij.
Taraxaci	,,
Digitalin	$\frac{1}{60}$th to $\frac{1}{30}$th of a grain.
Digitalis (powder)	gr. ss. to gr. iij.
Elaterine	gr. $\frac{1}{40}$th to gr. $\frac{1}{6}$th.
Elaterium	gr. $\frac{1}{12}$th to gr. $\frac{1}{4}$th.
Ergota (powder)	gr. xx. to gr. lx.
Extractum Aconiti	gr. ss. to gr. ij.
Aloes Barbadensis	gr. v. to gr. xv.
,, Socotrinæ	,,
Anthemidis	gr. v. to gr. xxx.
Belæ liquidum	fʒj. to fʒiv.
Belladonnæ	gr. $\frac{1}{4}$th to gr. j., or more.
Calumbæ	gr. ij. to gr. v.
Cannabis Indicæ	gr. $\frac{1}{4}$th to gr. ij., or more.
Cinchonæ Flavæ liquidum	gtt. x. to fʒj.
Colchici	gr. ss. to gr. jss.
Colchici Aceticum	,,
Colocynthidis compositum	gr. v. to gr. xv.
Conii	gr. ij. to gr. v.
Ergotæ liquidum	gtt. xv. to fʒj.
Filicis liquidum	gtt. xx. to fʒij.
Gentianæ	gr. v. to gr. x., or more.
Glycyrrhizæ	,,
Hæmatoxyli	gr. v. to gr. xxx.
Hyoscyami	gr. v. to gr. xv.
Jalapæ	,,
Krameriæ	,,
Lupuli	,,
Nucis Vomicæ	gr. $\frac{1}{4}$th to gr. ij.

Extractum Opii	gr. ss. to gr. ij.
Opii liquidum	gtt. x. to gtt. xxv.
Pareiræ liquidum	fʒss. to fʒj.
Quassiæ	gr. ij. to gr. v.
Rhei	gr. v. to gr. xx.
Sarsæ liquidum	fʒj. to f℥j.
Stramonii	gr. ss. to gr. jss.
Taraxaci	gr. v. to gr. xxx.
Fel Bovinum (purificatum)	gr. v. to gr. xv.
Ferri Arsenias	gr. $\frac{1}{16}$th to gr. $\frac{1}{8}$th.
Carbonas saccharata	gr. v. to gr. xxx.
et Ammoniæ Citras	gr. v. to gr. xv.
et Quiniæ Citras	gr. v. to gr. viij.
Iodidum	gr. ij. to gr. x.
Oxidum magneticum	gr. v. to gr. xxx.
Perchloridi Liquor	gtt. iij. to gtt. x.
Pernitratis Liquor	gtt. xx. to fʒj.
Peroxidum	gr. xxx. to gr. lx.
Phosphas	gr. v. to gr. x.
Sulphas	gr. j. to gr. v.
,, exsiccata	gr. j. to gr. iij.
,, granulata	gr. j. to gr. v.
Ferrum Redactum	gr. ij. to gr. x.
Tartaratum	gr. v. to gr. xv.
Filix (powder)	gr. 60 to gr. 120.
Galbanum	gr. x. to gr. xx., seldom employed.
Gallæ	gr. v. to gr. xx.
Gentiana	gr. x. to gr. xxx., or more.
Glycerinum	fʒj. to fʒiv.
Guiacum (resina)	gr. x. to gr. xxx.
Hydrargyrum Corrosivum Sublimatum	gr. $\frac{1}{16}$th to gr. $\frac{1}{8}$th.
cum Cretâ	gr. ij. to gr. v.
Hydrargyri Iodidum Rubrum	gr. $\frac{1}{16}$th to gr. $\frac{1}{8}$th.
,, Viride	gr. j. to gr. ij.
Sulphuretum (for fumigating)	gr. lx.
Hyoscyamus (powder)	gr. v. to gr. x.
Infusum Anthemidis	f℥j. or f℥ij.
Aurantii	,,
Bucco	,,
Calumbæ	,,
Caryophylli	,,
Cascarillæ	,,
Catechu	,,
Chiratæ	,,
Cinchonæ flavæ	,,
Cuspariæ	,,
Cusso	f℥iv. to f℥viij.

Infusum Digitalis	f℥ss. to f℥j.
Ergotæ	f℥j. to f℥iv.
Gentianæ compositum	f℥j. to f℥ij.
Krameriæ	„
Lini	*Ad libitum.*
Lupuli	f℥j. to f℥ij.
Maticæ	„
Quassiæ	„
Rhei	„
Rosæ Acidum	„
Senegæ	„
Sennæ	„
Serpentariæ	„
Uvæ Ursi	„
Valerianæ	„
Iodum	gr. ¼th to gr. ½.
Ipecacuanha (expectorant)	gr. ¼th to gr. ij.
(emetic)	gr. xx.
Jalapa	gr. xv. to gr. xxx.
Jalapæ Resina	gr. viij. to gr. xv.
Kamela	gr. lx. to gr. cxx.
Kino	gr. x. to gr. xxx.
Krameria (powder)	gr. xx. to gr. lx.
Lactucarium	gr. v. to gr. xx.
Liquor Ammoniæ	gtt. x. to gtt. xx., largely diluted with water.
„ fortior	gtt. ij. to gtt. viij., largely diluted with water.
„ Acetatis	fʒss. to fʒij.
Antimonii Tartarizati	gtt. xx. to fʒij.
Calcis	f℥j. to f℥ij.
„ Saccharatus	fʒss. to fʒj.
Chlori	gtt. x. to gtt. xxx.
Morphiæ Hydrochloratis	gtt. xij. to gtt. xxx.
Potassæ	gtt. x. to gtt. xxx.
Sodæ	„
„ Arseniatis	gtt. iv. to gtt. x.
„ Chloratæ	gtt. xv. to fʒj.
Strychniæ	gtt. x. to gtt. xv.
Lithiæ Carbonas	gr. iij. to gr. vj.
Citras	gr. v. to gr. x.
Lobelia	gr. j. to gr. v.
Lupulina	gr. iij. to gr. x.
Magnesia et Carbonas (antacid)	gr. v. to gr. xx.
(purgative)	gr. xx. to gr. lx.
Magnesia Sulphas	gr. lx. to ℥j.
Manna	gr. lx. to ℥ss.
Mastiche	gr. v. to gr. x.
Matica (in powder)	gr. xx. to gr. lx.
Mistura Ammoniaci	f℥j. to fʒij.

Mistura Amygdalæ	f℥j. to f℥ij.
Creasoti	„
Cretæ	„
Ferri aromatica	„
„ composita	„
Guaiaci	„
Scammonii	„
Morphiæ Acetas	gr. ⅛th to gr. ½.
Hydrochloras	„
Sulphas	„
Moschus	gr. v. to gr. xx.
Mucilago Acaciæ	*ad libitum.*
Tragacanthæ	„
Mucuna	gr. x. to gr. xx.
Myrrha (powder)	„
Nux Vomica	gr. ¼th to gr. iij.
Oleum Amygdalæ	f℥j. or f℥ij.
Anethi	gtt. j. to gtt. v.
Anisi	„
Anthemidis	„
Cajuputi	„
Carui	„
Caryophylli	„
Cinnamomi	„
Copaibæ	gtt. xv. to gtt. xxx.
Coriandri	gtt. j. to gtt. v.
Crotonis	gtt. j. to gtt. ij.
Cubebæ	gtt. xv. to gtt. xxx.
Juniperi	gtt. j. to gtt. v.
Lavandulæ	„
Limonis	„
Menthæ (viridis et piperitæ)	„
Morrhuæ	fʒij. to f℥j.
Myristicæ	gtt. j. to gtt. v.
Olivæ	f℥ss. to f℥j.
Pimentæ	gtt. j. to gtt. v.
Ricini	f℥ss. to f℥j.
Rosmarini	gtt. j. to gtt. v.
Rutæ	„
Sabinæ	„
Terebinthinæ (stimulant)	gtt. x. to gtt. xxx.
„ (purgative)	fʒj. to f℥j.
Opium	gr. ss. to gr. iij.
Oxymel	fʒj. to fʒiv.
Pareira (powder)	gr. xxx. to gr. lx.
Pepsina	gr. v. to gr. xx.
Phosphorus	gr. 1/40th to gr. 1/10th.
Pilula Aloes Barbadensis	gr. v. to gr. xv.
et Assafœtidæ	„
et Myrrhæ	„

Pilula Aloes Socotrinæ	gr. v. to gr. xv.
Assafœtidæ composita	„
Calomelanos composita	gr. ii. to gr. v.
Cambogiæ composita	gr. v. to gr. xv.
Colocynthidis composita	„
„ et Hyoscyami	„
Ferri Carbonatis	„
Ferri Iodidi	„
Hydrargyri	gr. ij. to gr. x.
Opii	gr. v. to gr. x.
Plumbi cum Opio	gr. iv. to gr. viij.
Rhei composita	gr. v. to gr. xv.
Scillæ composita	„
Piper	gr. v. to gr. xxx.
Plumbi Acetas	gr. ss. to gr. iij.
Podophylli Resina	gr. ¼th to gr. ij.
Potassæ Acetas (diuretic)	gr. v. to gr. xxx.
„ (purgative)	gr. lx. and upwards.
Bicarbonas (antacid)	gr. v. to gr. xx.
„ (eliminating agent)	gr. xxx. and upwards.
Carbonas	gr. v. to gr. x.
Chloras	gr. v. to gr. xx.
Citras	gr. xx. to gr. lx.
Nitras	gr. x. to gr. lx.
Sulphas	gr. lx. to cxx.
Tartras	„
„ Acida	gr. xx. to gr. lx. and upwards.
Potassii Bromidum	gr. ij. to gr. x.
Iodidum	„
Pulvis Amygdalæ compositus	*ad libitum.*
Antimonialis	gr. ij. to gr. viij.
Aromaticus	gr. v. to gr. xv.
Catechu compositus	gr. x. to gr. xxx.
Cretæ aromaticus	gr. x. to gr. lx.
„ cum Opio	gr. x. to gr. xl.
Ipecacuanhæ cum Opio	gr. v. to gr. x.
Jalapæ compositus	gr. xxx. to gr. lx.
Kino cum Opio	gr. v. to gr. xx.
Rhei compositus	gr. xx. to gr. lx.
Scammonii compositus	gr. v. to gr. xx.
Tragacanthæ compositus	*ad libitum.*
Quiniæ Sulphas	gr. j. to gr. x.
Resina Jalapæ	gr. iij. to gr. x.
Scammonii	gr. ij. to gr. v.
Rheum	gr. xv. to gr. xxx.
Ricini Oleum	f℥ss. to f℥j.
Sabadilla	gr. ss. to gr. v.
Sabina (powder)	gr. iij. to gr. xv.
Santonica	gr. xxx. to gr. lx.

Santoninum	gr. j. to gr. iv.
Scammoniæ Resina	gr. ij. to gr. v.
Scammonium	gr. v. to gr. x.
Scilla	gr. j. to gr. v.
Senega (powder)	gr. x. to gr. xx.
Senna (leaves)	¼ ounce and upwards.
Sinapis (emetic)	℥ss.
Sodæ Acetas	gr. x. to gr. xl.
Arsenias (crystals)	gr. 1/30th to gr. 1/16th.
Biboras	gr. xx. to gr. lx.
Bicarbonas	gr. v. to gr. xxx.
Carbonas	gr. v. to gr. xx.
" exsiccata	gr. ij. to gr. viij.
et Potassæ Tartras	gr. lx. to gr. cxx.
Hyposulphis	gr. xx. to gr. xxx.
Phosphas	gr. xx. to ℥ss.
Sulphas	¼ to ½ ounce.
Spiritus Ætheris	fʒss. to fʒj.
" nitrosi	gtt. xv. to fʒij.
Ammoniæ aromaticus	gtt. xx. to fʒj.
Armoraciæ compositus	fʒj. to fʒiv.
Cajuputi	gtt. v. to gtt. xx.
Camphoræ	gtt. xx. to gtt. xxx.
Chloroformi	gtt. xv. to fʒj.
Juniperi	"
Lavandulæ	gtt. x. to gtt. xxx.
Menthæ piperitæ	"
Myristicæ	"
Pyroxylicus	gtt. xv. to gtt. xxx.
Rosmarini	gtt. x. to gtt. xxx.
Stramonium (powder)	gr. j. to gr. iij.
Strychnia	gr. 1/16th to gr. ⅛th.
Succus Conii	fʒss. to fʒj.
Limonis	f℥ss. to f℥iv.
Scoparii	fʒss. to fʒj.
Taraxaci	fʒj. to fʒiv.
Sulphur Præcipitatum	gr. xv. to gr. lx.
Sublimatum	"
Suppositorium Acidi Tannici	One.
Morphiæ	"
Syrupus	fʒj. to fʒij.
Aurantii	"
" floris	"
Ferri Iodidi	gtt. xx. to fʒj.
" Phosphatis	fʒss. to fʒij.
Hemidesmi	fʒj. to fʒij.
Limonis	"
Mori	"
Papaveris	"
Rhœados	"
Rosæ Gallicæ	"
Scillæ	gtt. xx. to fʒj.
Sennæ	fʒj. to fʒiv.

Syrupus Tolutanus	fʒj. to fʒij.
Zingiberis	„
Tamarindus	*Ad libitum.*
Tannin	gr. iij. to gr. x.
Tinctura Aconiti	gtt. x. to gtt. xv.
Aloes	fʒj. to fʒiij.
Arnicæ	gtt. x. to gtt. xxx.
Assafœtidæ	fʒss. to fʒij.
Aurantii	„
Belladonnæ	gtt. x. to gtt. xxx.
Benzoini composita	fʒss. to fʒj.
Bucco	fʒj. to fʒij.
Calumbæ	„
Camphoræ cum Opio	„
Cannabis Indicæ	gtt. x. to gtt. xxx.
Cantharidis	fʒss. to fʒj.
Capsici	gtt. x. to gtt. xxx.
Cardamomi composita	fʒss. to fʒij.
Cascarillæ	„
Castorei	„
Catechu	„
Chiratæ	„
Cinchonæ composita	„
„ flavæ	„
Cinnamomi	„
Cocci	fʒss. to fʒj.
Colchici Seminis	gtt. x. to fʒj.
Conii fructus	gtt. xx. to fʒj.
Croci	fʒss. to fʒj.
Digitalis	gtt. x. to gtt. xxx.
Ergotæ	fʒss. to ʒij.
Ferri Perchloridi	gtt. x. to gtt. xxx.
Gallæ	fʒss. to fʒij.
Gentianæ composita	„
Guaiaci Ammoniata	„
Hyoscyami	„
Iodi	gtt. xx. to fʒj.
Jalapæ	fʒj. to fʒiv.
Kino	fʒss. to fʒij.
Krameriæ	„
Lavandulæ composita	„
Limonis	fʒss. to fʒj.
Lobeliæ	gtt. x. to gtt. xxx.
„ etherea	„
Lupuli	fʒss. to fʒij.
Myrrhæ	„
Nucis Vomicæ	gtt. x. to gtt. xxx.
Opii	gtt. xv. to fʒj.
Quiniæ composita	fʒj. to fʒij.
Rhei	fʒj. to fʒiv.
Sabinæ	gtt. x. to fʒj.
Scillæ	gtt. x. to gtt. xxx.
Serpentariæ	fʒss. to fʒij.

Tinctura Stramonii	gtt. x. to gtt. xxx.
Tolutana	,,
Valerianæ	fʒss. to fʒij.
,, ammoniata	,,
Zingiberis	fʒss. to fʒj.
Tragacantha (in powder)	*Ad libitum.*
Trochisci Acidi Tannici	1 to 4, or more.
Bismuthi	,,
Catechu	,,
Morphiæ	,,
,, et Ipecacuanhæ	,,
Opii	,,
Uva Ursi (powder)	gr. xx. to gr. xxx.
Valeriana (powder)	gr. xx. to gr. xxx.
Veratria	gr. $\frac{1}{12}$ to $\frac{1}{6}$th.
Vinum Aloes	f℥ss. to f℥j.
Antimoniale	gtt. xx. to fʒij.
Colchici	gtt. x. to fʒj.
Ferri	f℥j. to f℥ij.
Ipecacuanhæ	fʒj. to f℥j.
Opii	gtt. xv. to gtt. xxx.
Zinci Acetas	gr. j. to gr. iij.
Carbonas	gr. iij. to gr. xx.
Chloridum	gr. $\frac{1}{4}$th to gr. ij.
Oxidum	gr. iij. to gr. xx.
Sulphas (tonic)	gr. j. to gr. v.
,, (emetic)	gr. xx.
Valerianas	gr. ss. to gr. iij.
Zingiber	gr. iij. to gr. xx.

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